Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable"	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks Calibration Blanks	No	Potassium was detected in the method blank at a concentration of 3.012 mg/kg. Data qualification was not considered necessary because all potassium results were reported at concentrations greater than five times the amount found in the method blank. Various metals were detected in the catfish blank. Data qualification was not considered necessary based on the catfish blank. The catfish blank concentrations were subtracted from the catfish laboratory control sample to determine the accuracy of the digestion. For positive blank results, the affected sample results were qualified as nondetect at the estimated quantitation limit (EQL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS/MSD CR-11-T01N-TRV	Yes	The matrix quality control results for the Spring 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Spring 2003 sampling event.
Method QC • PDS CR-11-T01N-TRV • Serial Dilution CR-7-T02N-TRV • Internal Standards	No	The method quality control results for the Spring 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Spring 2003 sampling event. The internal standard recovery for germanium for several samples and CCVs slightly exceeded the method acceptance range of 30-120%. Germanium was used for quantification of zinc results. The results for the samples and resultant qualification are summarized in Table 1.1. No qualification was issued for the internal standard recoveries associated with the CCVs because the zinc recoveries were within the acceptance limits.
Field QC • Field Duplicate CR-8-T02N-TRV/CR-8-T02D-TRV	Yes	The field QC results for the Spring 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Spring 2003 sampling event.
Nondetect Results w/ Elevated RLs?	No	
Package Completeness	Yes	
Other parameters Evaluated based on case narrative comments or review of laboratory performance parameters.	No	LCS - Two types of LCSs were analyzed with each data package, an in-house prepared catfish LCS spiked with all 25 target analytes and a solid LCS which consisted of a purchased standard reference material (SRM). The solid LCS included 15 of the 25 target analytes. The catfish LCS recoveries were all within the acceptance limits. Several of the concentrations found for the solid LCS were outside the manufacturer's control limits. However, the reviewer considered them acceptable if the recoveries were within the QAPP acceptance limits of 75-125%. Iron was below the lower limit of the acceptance range with a recovery of 47.9%. Vanadium exceeded the upper limit of the acceptance range with a recovery of 153%. Data qualification was not considered necessary for vanadium because the catfish LCS recoveries and the MS/MSD recoveries were within the acceptance limits. ICS - Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Internal Standard Recoveries for Germanium (Ge)

Sample ID	Internal Standard (Ge) Recovery (%)	Action for Zinc Results
CR-7-T02N-TRV	126.9	J IS-I
CR-8-T01N-TRV	128.6	J IS-I
CR-8-T02N-TRV	126.1	J IS-I
CR-10-T01N-TRV	122.9	J IS-I
CR-13-T01N-TRV	122.9	J IS-I
CR-14-T01N-TRV	122.0	J IS-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: 853520C Sampling Event: June 2003

Matrix: Soil ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 08/22/03

Peer Reviewer: Stacey Coker Date Completed: 09/14/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses
				Metals
BOC1-T01N-TRV[1]	SA	835320-030	B	X
BOC1-T02N-TRV[1]	SA	835320-031	B	X
BOC1-T03N-TRV[1]	SA	835320-032	B	X
BOC2-T01N-TRV[1]	SA	835320-033	B	X
BOC2-T02N-TRV	SA	835320-034	B	X
BOC2-T03N-TRV	SA	835320-035	B	X
BOC3-T01N-TRV[1]	SA	835320-036	B	X
BOC3-T02N-TRV[1]	SA	835320-037	B	X
BOC-3-T03N-TRV	SA	835320-038	B	X
BOC-4-T01N-TRV	SA	835320-039	B	X
BOC-4-T02N-TRV	SA	835320-040	B	X
BOC-4-T03N-TRV	SA	835320-041	B	X
BOC-5-T01N-TRV	SA	835320-042	B	X
BOC-5-T02N-TRV	SA	835320-043	B	X
BOC-5-T03N-TRV	SA	835320-044	B	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

TRV = Terrestrial Vertebrate

[1]Although the field ID recorded on the COC included a dash after the "C", this first dash was inadvertently omitted at sample log-in.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issue not affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

Due to limited sample volume for samples BOC1-T02N-TRV, BOC2-T02N-TRV, BOC2-T03N-TRV (mercury only), BOC3-T02N-TRV (ICP-MS Metals Only), BOC3-T03N-TRV (mercury only), BOC-4-T02N-TRV (ICP-MS Metals Only), BOC-4-T03N-TRV (mercury only), BOC-5-T02N-TRV (ICP-MS Metals Only), and BOC-5-T03N-TRV (mercury only), it was not possible to weigh out 0.50 grams for the

SW846 3050 digestions or 0.60 grams for the SW846 7471A digestions as specified in the Standard Operating Procedures. The sample results and reporting limits have been adjusted accordingly for the weight used for digestion.

The amount of sodium present in the interference check samples is 5 times greater than the linear range of the instruments. The instrument software is unable to provide an estimated value for an analytes that exceeds the linear range by this amount. Therefore, the ICS AB recoveries for sodium could not be calculated and appear in Form 4 as 0%. This was not considered to affect the usability of the data because no samples reported contained concentrations of the interferent elements (aluminum, calcium, magnesium, and iron) approaching the concentrations present in the ICS A and ICS AB solution.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable"	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Samples BOC1-T01N-TRV, BOC1-T02N-TRV, BOC1-T03N-TRV, BOC2-T01N-TRV, BOC2-T02N-TRV, BOC2-T03N-TRV, BOC3-T01N-TRV, and BOC3-T02N-TRV should have been logged in as BOC-1-T01N-TRV, BOC-1-T02N-TRV, BOC-1-T03N-TRV, BOC-2-T01N-TRV, BOC-2-T02N-TRV, BOC-2-T03N-TRV, BOC-3-T01N-TRV, and BOC-3-T02N-TRV in order to match the field IDs on the COC form.
Holding Times	Yes	
Method Blanks Calibration Blanks	No	Potassium was detected in the method blank at a concentration of 3.051 mg/kg. Data qualification was not considered necessary because all potassium results were reported at concentrations greater than five times the amount found in the method blank. Mercury was detected in the method blank at a concentration of 0.0024 mg/kg. All mercury results were qualified as nondetect (U). Various metals were detected in the catfish blank. Data qualification was not considered necessary based on the catfish blank. The catfish blank concentrations were subtracted from the catfish laboratory control sample to determine the accuracy of the digestion. For positive blank results, the affected sample results were qualified as nondetect at the estimated quantitation limit (EQL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS/MSD BOC2-T01N-TRV BOC2-T02N-TRV BOC2-T03N-TRV	No	Two results for sample BOC2-T01N-TRV were qualified on the basis of matrix spike results. These are summarized in Table 1.1. The RPD between the MS/MSD for mercury for sample BOC2-T02N-TRV exceeded the criterion of ≤25% with an RPD of 67.3%. Data qualification was not considered necessary because both recoveries were within the acceptance limits and different sample amounts were used for the MS and MSD resulting in a higher spike concentration for the MSD and a calculated RPD which is not fully representative of the precision. The RPD between the MS%R and the MSD%R is 2% indicating acceptable precision. The MSD recovery for iron for BOC2-T03N-TRV was below the lower limit of the acceptance range of 75-125% with a recovery of 50.4%. Data qualification was not considered necessary because the MS recovery was within acceptance limits for BOC2-T03N-TRV and the iron MS and MSD recoveries for BOC2-T02N-TRV and BOC2-T01N-TRV within the acceptance limits. The matrix quality control results for the Spring 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment for the Spring 2003 sampling event.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable"	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • PDS BOC2-T01N-TRV BOC2-T02N-TRV BOC2-T03N-TRV • Serial Dilution BOC-2-T01N-TRV • Internal Standards	No	The method quality control results for the Spring 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Spring 2003 sampling event. The internal standard recovery for germanium for several samples and CCVs slightly exceeded the acceptance range of 30-120%. Germanium was used for quantification of zinc results. The results for the samples and resultant qualification are summarized in Table 1.2. No qualification was issued for the internal standard recoveries associated with the CCVs because the zinc recoveries were within the acceptance limits.
Field QC Field Duplicate	Yes	This package did not include any field duplicate sample pairs. The field QC results for the Spring 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Spring 2003 sampling event.
Nondetect Results w/ Elevated RLs?	No	Due to limited sample volume for samples BOC1-T02N-TRV, BOC2-T02N-TRV, BOC2-T03N-TRV (mercury only), BOC3-T02N-TRV (ICP-MS Metals Only), BOC3-T03N-TRV (mercury only), BOC-4-T02N-TRV (ICP-MS Metals Only), BOC-4-T03N-TRV (mercury only), BOC-5-T02N-TRV (ICP-MS Metals Only), and BOC-5-T03N-TRV (mercury only), it was not possible to weigh out 0.50 grams for the SW846 3050 digestions or 0.60 grams for the SW846 7471A digestions as specified in the Standard Operating Procedures. The sample results and reporting limits have been adjusted accordingly for the weight used for digestion.
Package Completeness	Yes	
Other parameters Evaluated based on case narrative comments or review of laboratory performance parameters.	No	LCS - Two types of LCSs were analyzed with each data package, an in-house prepared catfish LCS spiked with all 25 target analytes and a solid LCS which consisted of a purchased standard reference material (SRM). The solid LCS included 15 of the 25 target analytes. The catfish LCS recoveries were all within the acceptance limits. Several of the concentrations found for the solid LCS were outside the manufacturer's control limits. However, the reviewer considered them acceptable if the recoveries were within the QAPP acceptance limits of 75-125%. Iron was below the lower limit of the acceptance range with a recovery of 70.7%. Vanadium and selenium exceeded the upper limit of the acceptance range with recoveries of 158% and 127%. Data qualification was not considered necessary for vanadium and selenium because the catfish LCS recoveries and the MS/MSD recoveries were within the acceptance limits. The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. ICS - Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Matrix QC Summary Table for Inorganic Analytes and Metals
for Sample BOC2-T01N-TRV

Analyte	MS%R	MSD %R	Comment	Qualification and Codes
Barium	119.8	118.8	Parent sample result qualified.	J MS-H
Zinc	132.1	128.7	Parent sample result qualified.	J MS-H

Evaluation criteria Matrix Spike % Recovery Limit – Laboratory Historical Control Limits

Table 1.2

Internal Standard Recoveries for Germanium (Ge)

Sample ID	Internal Standard (Ge) Recovery (%)	Action for Zinc Results
BOC1-T01N-TRV	123.3	J IS-I
BOC1-T02N-TRV	120.7	J IS-I
BOC1-T03N-TRV	121.4	J IS-I
BOC2-T02N-TRV	121.6	J IS-I
BOC2-T03N-TRV	120.9	J IS-I
BOC-3-T03N-TRV	121.1	J IS-I
BOC-4-T03N-TRV	123.5	J IS-I

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE WORM SAMPLES RESULTING FROM THE SOIL BIOASSAY CONDUCTED ON SOIL SAMPLES COLLECTED DURING THE JUNE 2003 SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004

URS

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139602

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Narratives 3-1

Section 4 Collective Summary/Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-2
4.3 Serial Dilution Results 4-2

Section 5 Collective Summary/Assessment of Field QC Results 5-1

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-1
6.4 Representativeness 6-1
6.5 Comparability 6-2
6.6 Sensitivity 6-2

List of Tables

Table 1-1 Field Sample IDs and Associated Data Package Numbers

List of Attachments

Attachment 1.1 Data Review Summary for Data Package BIO043

This report contains the results of the data validation conducted for 20 worm samples and associated quality control (QC) samples. The worms analyzed were those used in the earthworm bioassay done on soil samples collected in June of 2003. EnviroSystems, Inc. conducted the soil bioassay tests. The earthworms were harvested from the bioassay vessels in July 2003. EnviroSystems Inc. shipped the samples directly to STL-B under standard chain of custody procedures.

The worm samples were reported in one STL Burlington data package (BIO043). All samples were analyzed for total metals as defined in the RI/FS QAPP.

This data validation report describes the data validation process used and presents the data review results for the worm tissue samples and associated QC samples submitted to STL Burlington for chemical analysis. The field sample IDs and associated data package numbers are provided in Table 1-1.

Table 1-1
Field Sample IDs and Associated Data Package Numbers

Field ID	QC Designation
ARTIFICIAL SOIL1-WORM	
CR-10-T02N-WORM	
CR-11-T02N-WORM	
CR-13-T02N-WORM	
CR-14-T02N-WORM	
CR-2-T02N-WORM	
CR-4-T02N-WORM	
CR-5-T02N-WORM	
CR-6-T02N-WORM	
CR-7-T02N-WORM	
CR-8-T02N-WORM	
EB043	EB
TSS14-10-T02N-WORM	
TSS14-1-T02N-WORM	MS/LD/PDS/SD
TSS14-2-T02N-WORM	
TSS14-3-T02N-WORM	
TSS14-4-T02N-WORM	
TSS14-5-T02N-WORM	
TSS14-6-T02N-WORM	
TSS14-7-T02N-WORM	
TSS14-8-T02N-WORM	
TSS14-9-T02N-WORM	

FD = Field Duplicate MS = Matrix Spike LD = Laboratory Duplicate
SD = Serial Dilution PDS = Post-Digestion Spike EB = Equipment Blank

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate or spike duplicate analysis, post-digestion spike recoveries, ICP serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, rinsate blanks, field blanks, and trip blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e.,verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1 and is as follows: if no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used; if no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used; if no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

In all cases of professional judgement exercised in evaluating the need for qualification, the basis for the professional judgement used is provided in the data review narrative. Section 3.0 provides the data review narratives for each of the data packages.

The site-specific matrix spike/matrix spike duplicate (MS/MSD) results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of

that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (MS/MSD results, laboratory duplicate results, and serial dilution results) and associated sample qualification. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries which are included in Attachment 1. The data qualifiers, reason codes, and bias codes have been marked on the data sheets, and also stored in the electronic database.

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL Burlington data package BIO043 was used to evaluate laboratory performance criteria. If any problems were noted during review of the STL Burlington laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0.

The site-specific MS results, Laboratory Duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analyses, LD analyses, and the serial dilution results with the samples collected during the sampling event.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

The table below illustrates the site-samples that were used to prepare matrix spike samples. As one MS set was prepared and analyzed for 20 worm samples, the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
TSS14-1-T02N-WORM	Worm	BIO043	Total Metals

Four of 21 spike recoveries (approximately 9%) were outside of the laboratory historical QC acceptance limits. For the sample results that were greater than four times the spike amount, the MS results were not appropriate for assessing accuracy and precision. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of the outages.

Post-digestion spikes were conducted for all analytes to aid in determining whether the matrix spike results that were out of acceptance limits were caused by the sample matrix, a bias in the analytical system, or a combination of both. Recoveries for all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

The table below summarizes the results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Analyte	Number of Valid Spike Results	%R <75%	%R >125%	MS %R	Action
Aluminum	1	0	1	208.2	J MS-H All detected aluminum results
Antimony	1	0	0	103.2	None
Arsenic	1	0	0	101.7	None
Barium	1	0	0	101.2	None
Beryllium	1	0	0	102.6	None
Boron	1	0	0	100.8	None
Cadmium	1	0	0	101.6	None
Chromium	1	0	0	106.5	None
Copper	1	0	0	115.2	None

Analyte	Number of Valid Spike Results	%R <75%	%R >125%	MS %R	Action
Iron	1	0	1	396.7	J MS-H All detected iron results
Lead	1	0	1	128.7	J MS-H All detected lead results
Manganese	1	0	0	125.3	None
Mercury	1	0	0	83.4	None
Molybdenum	1	0	0	104.6	None
Selenium	1	1	0	65.3	J/UJ MS-L All selenium results
Nickel	1	0	0	99.9	None
Thallium	1	0	0	110.3	None
Silver	1	0	0	98.4	None
Vanadium	1	0	0	104.1	None
Zinc	1	0	0	108.6	None

Based on the matrix spike recoveries all detected results for aluminum, iron, lead, and all results for selenium have been qualified as estimated.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

The table below illustrates the site-samples that were used to prepare laboratory duplicate samples. As one LD were prepared and analyzed for 20 worm samples, the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
TSS14-1-T02N-WORM	Worm	BIO043	Total Metals

The relative percent differences (RPDs) or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within QAPP acceptance limits. Based on the LD results, the overall level of precision demonstrated is considered to be acceptable.

4.3 SERIAL DILUTION RESULTS

The table below illustrates the site-samples that were used for the serial dilution test.

Sample ID	Matrix	Data Package	Analyses
TSS14-1-T02N-WORM	Worm	BIO043	Total Metals

Only analyte concentrations greater than 50 times their CRDL are appropriate for comparing to the evaluation criteria. Valid results were applicable for aluminum, iron, manganese, and potassium. However, no %Ds between the original sample results and the result obtained from a sample diluted 1:5 were >10% and no qualification of data was required.

No field duplicate, rinsate blanks, or field blank samples were associated with the worm samples.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank contamination. Some sample results were qualified as estimated on the basis of the MS results. A general overall assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

One hundred percent of the LD results satisfied the applicable criteria. As such, the overall level of precision demonstrated is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of LCSs and MS.

All of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP. As such, all of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP which is considered to be indicative of acceptable overall accuracy with respect to the analytical system.

Approximately, 92% of the MS spike recoveries satisfied the applicable evaluation criteria for accuracy specified in QAPP which is considered to be indicative of acceptable overall accuracy attained with respect to the site matrix.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

Twenty samples were submitted for metals analysis. All of the metal results for the twenty samples analyzed are considered usable as qualified for meeting project objective. As such, the completeness for the samples analyzed is 100% which satisfies the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. As noted in Section 6.1, 100% of the LD results satisfied the precision evaluation indicating that sample processing and subsampling procedures were acceptable. No field duplicate samples were collected for the worm samples.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

The sample results and reporting limits have been adjusted accordingly for the weight used for digestion. It is anticipated that all data will be usable in the risk assessment. No screening level criteria for worms were provided in the QAPP or the Baseline Ecological Risk Assessment to which RLs for nondetect analytes could be compared. However, non-detect results were evaluated against the ecological RBSLs. No non-detect results were reported at values above the ecological RBSLs.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO043 Sampling Event: August 2003

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Sheri O'Connor Date Completed: 11/16/03

Peer Reviewer: Geoff Webb Date Completed: 11/19/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses
				Metals
ARTIFICIAL SOIL1-WORM	SA	536378	B	X
CR-10-T02N-WORM	SA	536382	B	X
CR-11-T02N-WORM	SA	536381	B	X
CR-13-T02N-WORM	SA	536386	B	X
CR-14-T02N-WORM	SA	536394	B	X
CR-2-T02N-WORM	SA	536385	B	X
CR-4-T02N-WORM	SA	536383	B	X
CR-5-T02N-WORM	SA	536393	B	X
CR-6-T02N-WORM	SA	536384	B	X
CR-7-T02N-WORM	SA	536379	B	X
CR-8-T02N-WORM	SA	536380	B	X
EB043	EB	536399	B	X
TSS14-10-T02N-WORM	SA	536389	B	X
TSS14-1-T02N-WORM[1]	MS	536398	B	X
TSS14-2-T02N-WORM	SA	536391	B	X
TSS14-3-T02N-WORM	SA	536388	B	X
TSS14-4-T02N-WORM	SA	536390	B	X
TSS14-5-T02N-WORM	SA	536396	B	X
TSS14-6-T02N-WORM	SA	536395	B	X
TSS14-7-T02N-WORM	SA	536392	B	X
TSS14-8-T02N-WORM	SA	536387	B	X
TSS14-9-T02N-WORM	SA	536397	B	X

Matrix: S = Solid W = Water B = Biota FB = Field Blank

QC Type: SA = Sample TB = Trip Blank EB = Equipment Blank FD = Field Duplicate

[1] Additional sample volume provided and used for matrix QC.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Due to a loss of the 6010B digestate for sample CR-11-T02N-WORM, it was necessary to analyze the 6020 digestate on the Trace ICP to complete the 6010B analysis.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results, and their qualifications are summarized in Table 1.1. Target analytes were detected in the equipment blank (EB043) after accounting for method blank contamination. The qualifications from these results are summarized in Table 1.1.
Matrix QC • MS and LD TSS14-1-T02N-WORM	No	Several results for sample TSS14-1-T02N-WORM was qualified on the basis of matrix spike results. The results and actions are summarized in Table 1.2. All LD results satisfied the applicable concentration dependent evaluation criterion. The matrix spike and laboratory duplicate results for the worm samples will be evaluated collectively and any additional qualification will be summarized in the associated overall assessment for the worm samples.
Method QC • PDS and Serial Dilution TSS14-1-T02N-WORM • Internal Standards	Yes	Serial dilution criteria were met, and qualification of data was not necessary.
Field QC	Yes	This package did not include any field QC results.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters Evaluated based on case narrative comments or review of laboratory performance parameters.	No	The CRDL standard was included in the analytical data packages, although not required. All recoveries were within the 50-150% criteria, with the exception of several aluminum, chromium, and iron results. Associated aluminum, chromium, and iron results may potentially be biased high for values reported close to the aluminum, chromium, and iron concentrations of 40 mg/kg, 2 mg/kg, and 20 mg/kg, respectively. Sample data have not been qualified on the basis of CRDL standards.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	

Review Parameter	Criteria Met?	Comments
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	**ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Laboratory Blank Results Outside Evaluation Criteria Resulting in Data Qualification

Analyte	CCB (µg/L)	MB (mg/Kg)	EB EB043 (mg/Kg)	IDL (µg/L)	Sample Qualified	Qualification Code
Antimony	5.6	0.700 0.716 0.573			All detectable antimony results.	U MB-I Or U MB,CCB - I
Lead	-3.1 -2.2		0.28		With the exceptions of CR-11-T02N-WORM, TSS14-6-T02N-WORM, TSS14-9-T02N-WORM, All lead results.	J/UJ CCB-L Or J/UJ EB,CCB-L Or U EB-I
Molybdenum			0.13		ARTIFICIAL-SOIL1-WORM	U EB-I
Nickel	-2.4	-0.563 -0.491			With the exception of CR-11-T02N-WORM, All nickel results.	J/UJ MB-L Or UJ/J MB,CCB-l
Silver		-0.129			With the exception of CR-11-T02N-WORM, all silver results.	UJ MB-L
Silver	5.6				CR-11-T02N-WORM	U CCB-I
Iron	42.6				EB043	U CCB-I
Chromium		0.063			EB043	U MB-I

CCB = Continuing Calibration Blank MB = Method of Preparation Blank
IDL = Instrument Detection Limit for Metals RB = Rinsate Blank
Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualifications for Sample TSS14-1-T02N-WORM

Analyte	MS%R	Comment	Action
Aluminum	208	Parent sample result qualified	J MS-H
Iron	397	Parent sample result qualified	J MS-H
Lead	129	Parent sample result qualified	J MS-H
Selenium	63.5	Parent sample result qualified	J/UJ MS-L

Evaluation criteria:
Matrix Spike % Recovery Limit 75 – 125 % for metals

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE FALL 2003 AQUATIC BIOTA SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

March 2004

URS

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Non-Valid Matrix Spikes 3-1
3.2.2 Laboratory Performance Review (LPR) Findings 3-1

Section 4 Collective Summary/Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-3
4.3 Serial Dilution Results 4-3

Section 5 Collective Summary/Assessment of Field QA Results 5-1

5.1 Field Duplicate Results 5-1
5.2 Rinsate Blank Results 5-1

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-1
6.4 Representativeness 6-1
6.5 Comparability 6-2
6.6 Sensitivity 6-2

List of Tables

Table 4-1 Field Samples Designated for Matrix QC Analysis

Table 4-2 Summary of Matrix Spike Results

Table 4-3 Summary of Laboratory Duplicate Exceedances

Table 4-4 ICP Serial Dilution Results

Table 5-1 Field Pairs Designated for Fall 2003 Biota Sampling Event

Table 5-2 Summary of Rinsate Blank Samples Collected for the Fall 2003 Biota Sampling Event

Table 5-3 Summary of Rinsate Blank Detections for Fall 2003 Biota Samples

TABLE OF CONTENTS

List of Attachments

Attachment 1.1 Data Review Summary for Data Package BIO048
Attachment 1.2 Data Review Summary for Data Package BIO049
Attachment 1.3 Data Review Summary for Data Package BIO050
Attachment 1.4 Data Review Summary for Data Package BIO051
Attachment 1.5 Data Review Summary for Data Package BIO052
Attachment 1.6 Data Review Summary for Data Package BIO053
Attachment 1.7 Data Review Summary for Data Package BIO054
Attachment 1.8 Data Review Summary for Data Package BIO055
Attachment 1.9 Data Review Summary for Data Package BIO056
Attachment 1.10 Data Review Summary for Data Package BIO057

This report contains the results of the data validation conducted for 174 biota samples collected in the fall of 2003 from Molycorp. The Fall 2003 aquatic biota sampling event was conducted in support of the RI/FS.

The biota samples were sent to Severn Trent Laboratories (STL) in Colchester, VT for analysis of metals and percent lipids (fish tissue only). The results were reported in ten data packages. This data validation report describes the data validation process used and presents the data review results for the biota samples reported in these ten packages. The field sample IDs and associated laboratory numbers are provided in the individual review summaries included as Attachment I of this report.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, ICP serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g. field duplicates).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g. thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method, matrix, and sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1, and is as follows: If no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used. If no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used. If no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

In all cases of professional judgement exercised in evaluating the need for qualification, the basis for the professional judgement used is provided in the data review narrative. Section 3.0 discusses the data review narratives for the data packages.

The site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. An evaluation of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only the parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for data packages BIO048 through BIO057, for a total of ten original data packages. In order to attain the frequency requirements for laboratory performance reviews, one data package (BIO048) was evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were identified which globally affected all relevant biota samples analyzed for the Fall 2003 Biota Sampling Event. Although most of the issues have been addressed in the individual summary reports, these common issues and conclusions are summarized below:

3.2.1 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.2 Laboratory Performance Review (LPR) Findings

As mentioned previously, one data package was given a full validation to assess the performance of the laboratory for all analyses. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. Despite that fact that data qualification did not result from the laboratory performance review, the following parameters (beyond the scope of the sample specific review) were reviewed and summarized in each package:

- Laboratory Control Sample (LCS)
- Continuing Calibration Verification (CCV)
- Interference Check Sample (ICS)

The site-specific matrix spike (MS), lab duplicate (LD), and serial dilution (SD) results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.3 present the matrix QC results associated with the Fall 2003 aquatic biota samples and the resultant data qualifiers.

The three biota matrices represented in this sampling event were aquatic plants (-PLA), fish (-RBT, -BRT, and -WS[A/J/Y]), and benthic macroinvertibrates (-BMI). The number of samples selected from each matrix for QC analyses represents at least 5% of the total samples of that matrix (in accordance with the QAPP), with the exception of the benthic macroinvertibrates. Twelve BMI samples were collected during the Fall 2003 sampling event; however, none were selected for matrix QC analysis. The table below summarizes the site samples that were used to prepare the matrix QC samples (MS, LD, and SD):

Table 4-1
Field Samples Designated for Matrix QC Analysis

Sample ID	Matrix	Data Package
RR-15-T03N-BRT	Fish	BIO048
LR-8A-T03N-BRT1	Fish	BIO049
LR-17-T03N-BRT2	Fish	BIO050
LR-16-T03N-BRT	Fish	BIO051
LR-8A-T01N-PLA	Aquatic Plant	BIO052
CABRESTO-T01N-BRT1	Fish	BIO053
RR-8-T01N-RPT1	Fish	BIO054
UFL1-T01N-BRT1	Fish	BIO055
ERL1-T01N-WSA	Fish	BIO056
ZWERGLE-T01N-BRT1	Fish	BIO057

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

A number of spikes were outside of the QC acceptance limits of 75%-125%, as summarized in Table 4-2. In general, qualification was limited to the parent sample if fewer than a quarter of the applicable matrix spike recoveries were outside the acceptance range. Conversely, if more than a quarter of the applicable matrix spike recoveries were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average matrix spike recovery, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

Table 4-2
Summary of Matrix Spike Results

Analyte	Average MS % Recovery	Recoveries <75%	Recoveries >125%	Number of Valid Spikes
Fish				
Aluminum	110.4	0	1	9
Antimony	112.6	0	1	9
Arsenic	111.1	0	2	9
Barium	105.9	0	0	9
Beryllium	108.4	0	0	9

Analyte	Average MS % Recovery	Recoveries <75%	Recoveries >125%	Number of Valid Spikes
Boron	106.5	0	0	9
Cadmium	106.4	0	0	9
Chromium	109.4	0	1	9
Cobalt	105.6	0	0	9
Copper	112.3	0	0	9
Iron	112.0	1	1	9
Lead	101.9	0	0	9
Manganese	108.9	0	0	9
Mercury	84.2	3	0	9
Molybdenum	106.9	0	0	9
Selenium	**86.8**	**4**	**2**	**9**
Nickel	98.6	1	0	9
Thallium	113.6	0	1	9
Silver	106.2	0	0	9
Vanadium	107.4	0	0	9
Zinc	109.9	0	2	9
Aquatic Plant				
Aluminum	N/A*	0	0	0
Antimony	70.6	1	0	1
Arsenic	93.6	0	0	1
Barium	100.6	0	0	1
Beryllium	104.1	0	0	1
Boron	100.7	0	0	1
Cadmium	95.8	0	0	1
Chromium	105.1	0	0	1
Cobalt	96.3	0	0	1
Copper	95.1	0	0	1
Iron	N/A*	0	0	0
Lead	85.1	0	0	1
Manganese	N/A	0	0	0
Mercury	112.4	0	0	1
Molybdenum	88.5	0	0	1
Selenium	70.4	1	0	1
Nickel	93.8	0	0	1
Thallium	110.2	0	0	1
Silver	99.7	0	0	1
Vanadium	103.5	0	0	1
Zinc	N/A*	0	0	0

* N/A = Not applicable. Spike concentrations were inappropriate relative to sample concentrations, therefore recoveries were not valid.

For each analyte except one where exceedances were observed, only the parent sample was qualified, since either fewer than half of the valid spike recoveries were outside of acceptance limits or there were an insufficient number of data points to warrant qualifying all of the data (PLA matrix). For selenium, although the average percent recovery was acceptable for the fish matrix, six of the nine recoveries were either above or below the acceptance range. Therefore, it was determined that the selenium results in all fish samples should be qualified as estimated, with an indeterminate bias (J/UJ MS-I).

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the matrix spike results that were outside of acceptance limits were caused by the sample matrix, a bias in the analytical system, or a combination of both. Recoveries for all applicable post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

With few exceptions, the relative percent differences (RPDs) or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within QAPP acceptance limits. The exceptions are summarized in the table below:

Table 4-3
Summary of Laboratory Duplicate Exceedances

Analyte	Matrix	Number of Exceedances	Number of LD Pairs
Calcium	Fish	3	9
Iron	Fish	1	9
Selenium	Aquatic Plant	1	1

In each case where exceedances were observed, only the parent sample was qualified, since either fewer than half of the results were outside of acceptance limits, or there were an insufficient number of data points to warrant qualifying all of the data.

4.3 SERIAL DILUTION RESULTS

The same samples designated for MS and LD analyses were also selected by the lab for the serial dilution test, to demonstrate whether interferences were present that could bias the reported results. Only analyte concentrations greater than 50 times their respective MDLs were evaluated. Several results for various analytes in the undiluted samples did not agree within 10% with those in a five-fold dilution of the samples. In general, qualification was limited to the parent samples if less than a quarter of the valid serial dilution results for a given metal were outside of the acceptance range. Conversely, qualification was generally considered necessary if more than a quarter of the results for a metal were outside the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set and the magnitude of outages were also taken into consideration. The table below summarizes the number of valid serial dilution results for each metal (exhibiting at least one valid serial dilution), the number of results outside the acceptance range, and the average %D.

Table 4-4
ICP Serial Dilution Results

Analyte	Average %D	%D > 10%	Number of Valid SDs
Fish			
Calcium	4.1	1	9
Chromium	3.7	0	1
Copper	4.5	0	1
Iron	21.5	1	1
Manganese	2.2	0	4
Potassium	**11.0**	**6**	**9**
Sodium	7.3	0	1
Zinc	4.3	1	8
Aquatic Plant			
Aluminum	3.9	0	1
Barium	2.8	0	1
Calcium	4.1	0	1
Cobalt	4.6	0	1
Copper	1.9	0	1
Iron	4.1	0	1
Lead	5.6	0	1
Manganese	5.4	0	1
Molybdenum	6.9	0	1
Nickel	5.3	0	1
Zinc	8.1	0	1

For all but one analyte where exceedances were observed, only the parent sample was qualified, since either fewer than half of the results were outside of acceptance limits or there were an insufficient number of data points to warrant qualifying all of the data (i.e., iron in fish). For potassium in the fish matrix, six of nine results exceeded 10% and the average %D also exceeded the 10% limit (11.0%). Therefore, it was determined that the potassium results in all fish samples should be qualified as estimated, with a low bias (J DL-L).

The field QC results were assessed collectively by matrix to determine the need for qualification of sample results of similar matrix. The following sections discuss the field QC results associated with the biota samples collected during the Fall 2003 Biota Sampling Event.

5.1 FIELD DUPLICATE RESULTS

Two field duplicate pairs were collected for the fish matrix, and none for either the aquatic plant or benthic macroinvertibrate matrices. The field duplicate results were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, summarized as follows. The RPD criterion of ≤50% was applied for cases in which both the sample and sample duplicate concentrations were greater than five times the RL. For field duplicate pairs where the sample or duplicate concentration was less than five times the reporting limits, the absolute difference between the sample and duplicate was compared to the criterion of ≤ 4 times the greater RL. The criteria were met for all analyses. The field duplicate pairs are identified in the table below:

Table 5-1
Field Pairs Designated for Fall 2003 Biota Sampling Event

Sample ID	Matrix	Data Package
LR-17-T03N/D-BRT1	Fish	BIO050
RR-8-T01N/D-RBT2	Fish	BIO054

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. The biota (fish) samples are unique in the respect that samples were taken independently of each other. Rinsate blanks were only necessary for samples in which the fish was separated into separate fillets and body remains samples by use of a knife. Table 5-2 summarizes the rinsate blank samples associated with the samples collected during the Fall 2003 Biota sampling event, two of which had a “BRT2” suffix, and one with a “BRT” suffix. The rinsate blank chemical analytical data is included in the data review summary for data package WAT186S.

Table 5-2
Summary of Rinsate Blank Samples Collected for the Fall 2003 Biota Sampling Event

Sample ID (SDG)	Metals	%Lipids
RB01T-BRT2-092603	X	X
RB02T-BRT2-100103	X	X
RB03T-BRT-100103	X	X
Frequency	9%	9%

Three rinsate blank samples was considered adequate in representing fish samples for consideration of cross-contamination potentials related to the sampling equipment.

Table 5-3 summarizes the detected rinsate blank results. Evaluation of the range of detected concentrations for each analyte reported in the rinsate blank samples provides an indication of

the reasonable maximum likely contribution for each of these analytes. A conservative approach for calculating equivalent concentrations was undertaken. This was based on the assumption that all contamination found in the blank aliquot analyzed would also be present in the sample aliquot analyzed. In addition, considering the different environmental and rinsate blank preparation procedures, the maximum likely contributions for the detected analytes would be minimal. An average percent solids of 90-100% was used for these calculations.

Table 5-2
Summary of Rinsate Blank Detections for Fall 2003 Biota Samples

Analytes	RL (ug/L)	# of Detections	Total # of Rinsate Blanks	% Detections	Average Conc. (ug/L)	Equivalent Average Conc. (mg/kg)	X5 Criteria (mg/kg)	Sample Concentration Range (mg/kg)
Molybdenum	0.2	1	3	33.3%	0.2	0.04-0.044	020-0.22	0.085-16.8
Zinc	2.3	1	3	33.3%	1.80	0.31-0.34	1.55-1.70	7.3-1610

The rinsate blank results demonstrate the lack of potential cross-contamination between sampling sites

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank contamination. In addition, some sample results were qualified as estimated on the basis of matrix, field, or laboratory QC results, as described in the individual data package review summaries. No data were rejected (i.e., deemed unusable). A general overall assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

Of 269 lab duplicate results, 264 satisfied the applicable evaluation criteria, for a total of 98.1%. All of the field duplicate results satisfied the applicable evaluation criteria, for a percentage of 100%. As such, the overall level of precision demonstrated is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of LCSs and MSs.

All of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP. This indicates acceptable overall accuracy with respect to the analytical system.

Eighty-nine percent of the MS recoveries (184 of 206 valid recoveries) satisfied the applicable evaluation criteria for accuracy specified in the QAPP, indicating that acceptable overall accuracy was attained with respect to the site matrix.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements in relation to the number of measurements requested.

All samples yielded valid results for all target analytes, with the exception of mercury in one sample (ERLI-T01N-BMI), for which there was insufficient sample. The completeness percentage was therefore greater than 99%, satisfying the completeness criteria specified in the QAPP.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS,

2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the Fall 2003 biota samples. The close agreement between the field duplicate results, as discussed above in Section 6.1, indicates that the samples collected were adequately representative of the medium sampled.

Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. Again, the close agreement between duplicates noted in Section 6.1 indicates that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable when precision and accuracy are found to be acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. Despite these dilutions, the IDLs reported for all samples met the QAPP RL requirements for biota samples even after adjusting for the dilution factor. Therefore, it is anticipated that all data will be usable in the risk assessment.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO048 Sampling Event: Fall 2003

Matrix: Soil ☐ Sediment ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **Yes**

Data Reviewer: Kathie Teuscher Date Completed: 11/06/03

Peer Reviewer: Peggy Schuler Date Completed: 11/10/03

The table below summarizes the results presented in this data package.

Field ID	Sample Date	QC Type	Lab ID	Matrix	Analyses	
					Metals	%Lipids
RR-15-T01N-BRT1	09/25/2003	SA	543769	B	X	X
RR-15-T01N-BRT2	09/25/2003	SA	543770	B	X	X
RR-15-T02N-BRT1	09/25/2003	SA	543771	B	X	X
RR-15-T02N-BRT2	09/25/2003	SA	543772	B	X	X
RR-15-T03N-BRT1	09/25/2003	SA	543773	B	X	X
RR-15-T03N-BRT2	09/25/2003	SA	543774	B	X	X
RR-15-T01N-BRT	09/25/2003	SA	543775	B	X	X
RR-15-T01N-PLA	09/25/2003	SA	543776	B	X	
RR-15-T01N-BMI(1)	09/25/2003	SA	543777	B	X	
RR-20-T01N-BRT1	09/25/2003	SA	543778	B	X	X
RR-20-T01N-BRT2	09/25/2003	SA	543779	B	X	X
RR-20-T02N-BRT1	09/25/2003	SA	543780	B	X	X
RR-20-T02N-BRT2	09/25/2003	SA	543781	B	X	X
RR-20-T03N-BRT1	09/25/2003	SA	543782	B	X	X
RR-20-T03N-BRT2	09/25/2003	SA	543783	B	X	X
RR-20-T01N-YOY	09/25/2003	SA	543784	B	X	X
RR-20-T02N-YOY	09/25/2003	SA	543785	B	X	X
RR-20-T03N-YOY	09/25/2003	SA	543786	B	X	X
RR-20-T01N-PLA	09/24/2003	SA	543787	B	X	
RR-20-T01N-BMI	09/25/2003	SA	543788	B	X	
EB048	09/25/2003	EB	543789	W	X	

(1) Field ID was logged into the laboratory as RR-15-T01N-BM1 (rather than RR-15-T01N-BMI)

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank EB = Laboratory Equipment Blank FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

Equipment Blanks were generated by the laboratory during the tissue homogenization step of sample preparation for biota samples. These blanks were processed with the samples and were evaluated as an additional Method Blank associated with the samples.

All sample results are reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms indicate %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks • Calibration Blanks	No	Various metals were detected in the homogenization (equipment) blank, the metals preparation blanks, and continuing calibration blanks. Table 1.1 summarizes the metals blank detections and the resultant data qualifications (limited to those samples and analytes requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS RR-15-T03N-BRT1 • PDS RR-15-T03N-BRT1 • LD RR-15-T03N-BRT1	No	The matrix spike concentrations were within 4x the sample concentrations and, therefore appropriate for assessing accuracy. The matrix spike recoveries were within the QC acceptance criteria of 75 – 125% with the exception of selenium (recovery = 69.3%). The selenium result was qualified as estimated, with low bias, in the parent sample (J MS-L). The post-digestion spike and the lab duplicate results were within QC criteria for all metals. The matrix quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Method QC • Serial Dilution RR-15-T03N-BRT1 • Internal Standards	No	The serial dilution analyses were not applicable for 19 metals with original results less than 50 times the IDL. For the remaining five (5) metals (calcium, copper, manganese, potassium, and zinc), the percent difference between the original results and the results for a 5-fold dilution exceeded the ≤10% criterion for zinc only (11.5%). The affected analyte was qualified as estimated, with low bias, in the parent sample (J, DL-L). The method quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Field QC • Field Duplicate • Rinsate Blank • Other (e.g. Splits)	Yes	No field duplicate pairs were submitted with this SDG. Rinsate blanks, if any, were analyzed and reported with water samples, and will be evaluated at a later date. The field QC results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 10-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no

Review Parameter	Criteria Met?	Comments
		effect on data usability.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	In addition to sample specific parameters, laboratory performance parameters were reviewed for this package. The results of this evaluation are provided below.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification and Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). When contacted for comment, the laboratory stated that the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification of Summary Form Data %Rec Calc %D Calc RPD Calc	Yes	
Method Specific QC Tuning ICSA/AB Thermal Stability Spectral Resolution Mass Calibration	Yes	Information regarding the mass calibration and resolution are not available due to software limitations. However, acceptable performance can be inferred from the other QC sample results, which satisfied evaluation criteria. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Aluminum (P)	-33.7 and -40.9 (CCB3, 4)			18.3	RR-20-T03N-BRT2	J CCB-L
Boron (P)		0.707		1.8	RR-15-T01N-PLA RR-15-T01N-BMI RR-20-T01N-PLA RR-20-T01N-BMI	U MB-I
Chromium (P)			0.12	16.8	RR-15-T03N-BRT2 RR-20-T02N-BRT2 RR-20-T02N-YOY	U MB-I

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Lead (P)	-1.5 (CCB4)	0.163	0.2	1.5	RR-15-T01N-BRT1 RR-15-T01N-BRT2 RR-15-T02N-BRT1 RR-15-T03N-BRT1 RR-15-T01N-BRT RR-20-T01N-BRT2 RR-20-T02N-BRT1 RR-20-T03N-BRT1 RR-20-T03N-BRT2 RR-20-T02N-YOY	U MB-I U MB-I U MB-I U MB-I U MB-I U MB-I U MB-I U MB-I U CCB, MB-I U CCB, MB-I
Molybdenum (P)	2.3 (CCB1)			2.0	RR-15-T01N-BRT1 RR-15-T01N-BRT2 RR-15-T02N-BRT1 RR-15-T03N-BRT1	U CCB-I
Selenium (MS)	-0.4 and -0.5 (CCB1, 2, 4) [Note: IDL > 4x ‖CCB‖ (i.e., CCB is negligible)]	-0.518		0.3	RR-15-T01N-BRT1 RR-15-T01N-BRT2 RR-15-T02N-BRT1 RR-15-T02N-BRT2 RR-15-T03N-BRT1 RR-15-T03N-BRT2 RR-15-T01N-BRT RR-15-T01N-PLA RR-15-T01N-BMI RR-20-T01N-BRT1 RR-20-T01N-BRT2 RR-20-T02N-BRT1 RR-20-T02N-BRT2 RR-20-T03N-BRT1 RR-20-T03N-BRT2 RR-20-T01N-YOY RR-20-T02N-YOY RR-20-T03N-YOY RR-20-T01N-PLA RR-20-T01N-BMI	J MB-L J MB-L UJ MB-L UJ MB-L UJ MB-L UJ MB-L J MB-L J MB-L UJ MB-L J MB-L J MB-L UJ MB-L J MB-L J MB-L UJ MB-L J MB-L J MB-L UJ MB-L UJ MB-L UJ MB-L
Sodium (P)		89.28	126	218.8	RR-15-T01N-BRT2 RR-15-T02N-BRT2 RR-15-T03N-BRT2 RR-15-T01N-PLA RR-20-T01N-BRT2 RR-20-T02N-BRT2 RR-20-T01N-PLA	U MB-I

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO049 Sampling Event: Fall 2003

Matrix: Soil ☐ Sediment ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Kathie Teuscher Date Completed: 11/10/03

Peer Reviewer: Peggy Schuler Date Completed: 11/10/03

The table below summarizes the results presented in this data package.

Field ID	Sample Date	QC Type	Lab ID	Matrix	Analyses	
					Metals	%Lipids
LR-1-T01N-BRT1	09/24/2003	SA	543895	B	X	X
LR-1-T01N-BRT2	09/24/2003	SA	543896	B	X	X
LR-1-T02N-BRT1	09/24/2003	SA	543897	B	X	X
LR-1-T02N-BRT2	09/24/2003	SA	543898	B	X	X
LR-1-T03N-BRT1	09/24/2003	SA	543899	B	X	X
LR-1-T03N-BRT2	09/24/2003	SA	543900	B	X	X
LR-1-T01N-BRT	09/24/2003	SA	543901	B	X	X
LR-1-T02N-BRT	09/24/2003	SA	543902	B	X	X
LR-1-T03N-BRT	09/24/2003	SA	543903	B	X	X
LR-1-T01N-YOY	09/24/2003	SA	543904	B	X	X
LR-1-T02N-YOY	09/24/2003	SA	543905	B	X	X
LR-1-T03N-YOY	09/24/2003	SA	543906	B	X	X
LR-1-T01N-PLA	09/24/2003	SA	543907	B	X	
LR-1-T01N-BMI	09/24/2003	SA	543908	B	X	
LR-8A-T01N-BRT1	09/24/2003	SA	543909	B	X	X
LR-8A-T01N-BRT2	09/24/2003	SA	543910	B	X	X
LR-8A-T02N-BRT1	09/24/2003	SA	543911	B	X	X
LR-8A-T02N-BRT2	09/24/2003	SA	543912	B	X	X
LR-8A-T03N-BRT1	09/24/2003	SA	543913	B	X	X
LR-8A-T03N-BRT2	09/24/2003	SA	543914	B	X	X
EB049	09/24/2003	EB	543915	W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank EB = Laboratory Equipment Blank FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

Equipment Blanks were generated by the laboratory during the tissue homogenization step of sample preparation for biota samples. These blanks were processed with the samples and were evaluated as an additional Method Blank associated with the samples.

All sample results are reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms indicate %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks • Calibration Blanks	No	Various metals were detected in the homogenization (equipment) blank, the metals preparation blanks, and continuing calibration blanks. Table 1.1 summarizes the metals blank detections and the resultant data qualifications (limited to those samples and analytes requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS LR-8A-T03N-BRT1 • PDS LR-8A-T03N-BRT1 • LD LR-8A-T03N-BRT1	No	The matrix spike concentrations were within 4x the sample concentrations and, therefore appropriate for assessing accuracy. The matrix spike recoveries were within the QC acceptance criteria of 75 – 125% with the exception of selenium and zinc (recoveries were 23.3% and 128.5%, respectively). The positive results in the parent sample (for both elements) were qualified as estimated, with low and high biases accordingly. The post-digestion spike results were within QC criteria for all metals. The lab duplicate exceed criteria for calcium (RPD = 52.1%). The result for the parent sample was qualified as estimated with an indeterminate bias. The matrix quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Method QC • Serial Dilution • LR-8A-T03N-BRT1 • Internal Standards	No	The serial dilution analyses were not applicable for 20 metals with original results less than 50 times the IDL. For the remaining four (4) metals (calcium, manganese, potassium, and zinc), the percent difference between the original results and the results for a 5-fold dilution exceeded the ≤10% criterion for potassium only (12.2%). The affected analyte was qualified as estimated with low bias, in the parent sample (J, DL-L). The method quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Field QC • Field Duplicate • Rinsate Blank • Other (e.g. Splits)	Yes	No field duplicate pairs were submitted with this SDG. Rinsate blanks, if any, were analyzed and reported with water samples, and will be evaluated at a later date. The field QC results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 10-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Laboratory Control Samples (LCSs) • Continuing Calibration Verifications (CCVs) • Interference Check Sample Results (ICSs) All LCS and CCV recoveries associated with project samples were within acceptance limits. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Boron (P)		0.734		6.3	LR-1-T01N-BMI	U MB-I
Chromium (P)		0.113		1.1	LR-1-T01N-BRT2 LR-1-T03N-BRT2 LR-1-T03N-BRT	U MB-I
Copper (P)		1.548	1.6	2.9	LR-1-T01N-BRT1 LR-1-T01N-BRT2 LR-1-T02N-BRT1 LR-1-T02N-BRT2 LR-1-T03N-BRT1 LR-1-T03N-BRT2 LR-1-T01N-BRT LR-1-T02N-BRT LR-1-T03N-BRT LR-1-T01N-YOY LR-1-T02N-YOY LR-1-T03N-YOY LR-8A-T01N-BRT1 LR-8A-T01N-BRT2 LR-8A-T02N-BRT1 LR-8A-T02N-BRT2 LR-8A-T03N-BRT1 LR-8A-T03N-BRT2	U MB-I

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Iron (P)			4.5	27.8	LR-1-T01N-BRT2 LR-1-T02N-BRT1 LR-1-T02N-BRT2 LR-1-T03N-BRT2 LR-8A-T01N-BRT2 LR-8A-T02N-BRT2 LR-8A-T03N-BRT2	U MB-I
Lead (P)	1.5 and 1.8	0.144	0.23	1.4	LR-1-T01N-BRT1 LR-1-T01N-BRT2 LR-1-T02N-BRT2 LR-1-T03N-BRT1 LR-1-T03N-BRT2 LR-1-T01N-BRT LR-1-T02N-BRT LR-1-T03N-BRT LR-1-T01N-YOY LR-1-T02N-YOY LR-1-T03N-YOY LR-8A-T01N-BRT1 LR-8A-T01N-BRT2 LR-8A-T03N-BRT1 LR-8A-T03N-BRT2	U CCB, MB-I
Molybdenum (P)	-1.1			1.1	LR-1-T03N-BRT LR-1-T01N-YOY LR-1-T02N-YOY LR-1-T03N-YOY LR-8A-T01N-BRT1 LR-8A-T01N-BRT2 LR-8A-T02N-BRT1 LR-8A-T02N-BRT2 LR-8A-T03N-BRT1 LR-8A-T03N-BRT2	J / UJ CCB-L
Sodium (P)		92.59	124	453.8	LR-1-T01N-BRT2 LR-1-T02N-BRT2 LR-1-T03N-BRT2 LR-1-T01N-PLA LR-8A-T01N-BRT2 LR-8A-T02N-BRT2 LR-8A-T03N-BRT2	U MB-I

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO050 Sampling Event: Fall 2003

Matrix: Soil ☐ Sediment ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Kathie Teuscher Date Completed: 11/12/03

Peer Reviewer: Peggy Schuler Date Completed: 11/19/03

The table below summarizes the results presented in this data package.

Field ID	Sample Date	QC Type	Lab ID	Matrix	Analyses	
					Metals	%Lipids
UFLI-T01N-BMI	9/22/03	SA	543916	B	X	
ERLI-T01N-BMI	9/22/03	SA	543917	B	X	
LR-17-T01N-BRT1	9/22/03	SA	543918	B	X	X
LR-17-T02N-BRT1	9/22/03	SA	543919	B	X	X
LR-17-T01N-BRT2	9/22/03	SA	543920	B	X	X
LR-17-T02N-BRT2	9/22/03	SA	543921	B	X	X
LR-17-T03N-BRT1	9/22/03	SA	543922	B	X	X
LR-17-T03D-BRT1	9/22/03	FD	543923	B	X	X
LR-17-T03N-BRT2	9/22/03	SA	543924	B	X	X
LR-17-T01N-RBT1	9/22/03	SA	543925	B	X	X
LR-17-T01N-RBT2	9/22/03	SA	543926	B	X	X
LR-17-T02N-RBT1	9/22/03	SA	543927	B	X	X
LR-17-T02N-RBT2	9/22/03	SA	543928	B	X	X
LR-17-T03N-RBT1	9/22/03	SA	543929	B	X	X
LR-17-T03N-RBT2	9/22/03	SA	543930	B	X	X
RR-12-T01N-BRT1	9/22/03	SA	543931	B	X	X
RR-12-T02N-BRT2	9/22/03	SA	543932	B	X	X
RR-12-T01N-BRT	9/22/03	SA	543933	B	X	X
RR-12-T01N-PLA	9/22/03	SA	543934	B	X	
RR-12-T01N-BMI	9/22/03	SA	543935	B	X	
EB050	9/22/03	EB	543936	W	X	

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample RB = Rinsate Blank EB = Laboratory Equipment Blank FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

An Equipment Blank (EB050) was generated by the laboratory during the tissue homogenization step of sample preparation for biota samples. This blank was processed with the samples and was evaluated as an additional Method Blank associated with the samples.

All sample results are reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms indicate %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Due to laboratory error, sample volume was lost for ERLI-T01N-BMI following the homogenization process for ICP metals. As a result, there was insufficient sample volume to repeat the sample preparation steps and the ICP/MS digestate was used for both the Trace ICP analysis and ICP/MS analysis. The limited available sample volume resulted in a reduced sample aliquot for the ICP/MS sample digestion procedure and the reporting limits were elevated proportionately. Furthermore, mercury analysis was not performed since there was no sample remaining.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks • Calibration Blanks	No	Various metals were detected in the homogenization (equipment) blank, the metals preparation blanks, and continuing calibration blanks. Table 1.1 summarizes the metals blank detections and the resultant data qualifications (limited to those samples and analytes requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS LR-17-T03N-BRT2 • PDS LR-17-T03N-BRT2 • LD LR-17-T03N-BRT2	No	The matrix spike concentrations were within 4x the sample concentrations and, therefore appropriate for assessing accuracy. The matrix spike recoveries were within the QC acceptance criteria of 75 – 125% with the exception of selenium (recovery was 146.1%). The nondetect result in the parent sample did not require qualification. The post-digestion spike and the lab duplicate results were within QC criteria for all metals. The lab duplicate results were within QC criteria for all metals. The matrix quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Method QC • Serial Dilution • LR-17-T03N-BRT2 • Internal Standards	No	The serial dilution analyses were not applicable for 20 metals with original results less than 50 times the IDL. For the remaining four (4) metals (calcium, manganese, potassium, and zinc), the percent difference between the original results and the results for a 5-fold dilution exceeded the ≤10% criterion for potassium only (15%). The affected analyte was qualified as estimated with low bias, in the parent sample (J, DL-L). The method quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC Field Duplicate LR-17-T03N/D-BRT1 Rinsate Blank Other (e.g. Splits)	Yes	The field duplicate results were within QC criteria for all metals. Rinsate blanks, if any, were analyzed and reported with water samples, and will be evaluated at a later date. The field QC results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Nondetect Results w/ Elevated RLs?	No	Due to laboratory error, metals analysis for sample ERLI-T01N-BMI was performed utilizing a limited sample volume. Consequently, several reporting limits were elevated proportionately. Most analytes were detected and therefore, the reporting limit is inconsequential. However, several results were reported as nondetect at levels slightly above the QAPP maximum reporting limits. The affected elements, listed in Table 2.1, were qualified (RL-I) to indicate the elevated reporting limits. The ICP/MS analyses were performed at a 10-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.
Package Completeness	No	Due to laboratory error and insufficient sample remaining, mercury analysis for sample ERLI-T01N-BMI was not performed.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Laboratory Control Samples (LCSs) • Continuing Calibration Verifications (CCVs) • Interference Check Sample Results (ICSs) All LCS and CCV recoveries associated with project samples were within acceptance limits. Because of a laboratory error resulting with insufficient remaining sample, metals analysis for sample ERLI-T01N-BMI was performed utilizing a significantly reduced sample volume (i.e., 0.24g rather than 1.0g) and modified digestion procedure. Such a small sample aliquot is likely to have some impact on sample representativeness. Therefore, the affected results were qualified as estimated with an indeterminate bias. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Chromium (MS)			1.1	0.20	UFLI-T01N-BMI ERLI-T01N-BMI LR-17-T01N-BRT1 LR-17-T02N-BRT1 LR-17-T01N-BRT2 LR-17-T02N-BRT2 LR-17-T03N-BRT1 LR-17-T03D-BRT1 LR-17-T03N-BRT2 LR-17-T01N-RBT1 LR-17-T02N-RBT1 LR-17-T02N-RBT2 RR-12-T01N-BRT RR-12-T01N-PLA RR-12-T01N-BMI	U MB-I
Copper (P)		1.858 and 1.655	1.6	2.2	ERLI-T01N-BMI LR-17-T01N-BRT1 LR-17-T01N-BRT2 LR-17-T02N-BRT2 LR-17-T03N-BRT2 LR-17-T01N-RBT1 LR-17-T01N-RBT2 LR-17-T02N-RBT1 LR-17-T02N-RBT2 LR-17-T03N-RBT1 LR-17-T03N-RBT2 RR-12-T01N-BRT1 RR-12-T02N-BRT2 RR-12-T01N-BRT	U MB-I
Lead (P)	1.5 and 1.9	0.268	0.18	1.4	LR-17-T01N-BRT1 LR-17-T02N-BRT1 LR-17-T01N-BRT2 LR-17-T03N-BRT1 LR-17-T03D-BRT1 LR-17-T01N-RBT1 LR-17-T01N-RBT2 LR-17-T02N-RBT1 LR-17-T02N-RBT2 LR-17-T03N-RBT1 RR-12-T01N-BRT1 RR-12-T02N-BRT2 RR-12-T01N-BRT	U CCB,MB-I U CCB,MB-I U CCB,MB-I U CCB,MB-I U CCB,MB-I U MB-I U MB-I U MB-I U MB-I U MB-I U MB-I U MB-I U MB-I
Molybdenum (P)	1.6	0.118		1.1	UFLI-T01N-BMI ERLI-T01N-BMI LR-17-T01N-BRT1 LR-17-T02N-BRT1 LR-17-T03D-BRT1	U CCB-I U MB-I U CCB-I U CCB-I U CCB-I

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Sodium (P)		139.5	105	453.8	LR-17-T01N-BRT2 LR-17-T02N-BRT2 LR-17-T03N-BRT2 LR-17-T01N-RBT2 LR-17-T02N-RBT2 LR-17-T03N-RBT2 RR-12-T02N-BRT2 RR-12-T01N-PLA	U MB-I

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 2.1

Detection Limits Above QAPP Required Maximums (Sample ERLI-T01N-BMI)

Analyte	Reported Result (mg/kg)	QAPP Required RL (mg/kg)
Antimony	2.1 U	1
Arsenic	0.83 U	0.2
Selenium	1.2 U	0.5
Silver	0.67 U	0.5
Thallium	0.42 U	0.27
Vanadium	1.2 U	1

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO051 Sampling Event: Fall 2003

Matrix: Soil ☐ Sediment ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Kathie Teuscher Date Completed: 11/17/03

Peer Reviewer: Peggy Schuler Date Completed: 11/19/03

The table below summarizes the results presented in this data package.

Field ID	Sample Date	QC Type	Lab ID	Matrix	Analyses	
					Metals	%Lipids
LR-16-T01N-BRT1	9/23/03	SA	543937	B	X	X
LR-16-T02N-BRT1	9/23/03	SA	543938	B	X	X
LR-16-T03N-BRT1	9/23/03	SA	543939	B	X	X
LR-16-T01N-BRT2	9/23/03	SA	543940	B	X	X
LR-16-T02N-BRT2	9/23/03	SA	543941	B	X	X
LR-16-T03N-BRT2	9/23/03	SA	543942	B	X	X
LR-16-T01N-YOY	9/23/03	SA	543943	B	X	X
LR-16-T02N-YOY	9/23/03	SA	543944	B	X	X
LR-16-T03N-YOY	9/23/03	SA	543945	B	X	X
LR-16-T01N-BRT	9/23/03	SA	543946	B	X	X
LR-16-T02N-BRT	9/23/03	SA	543947	B	X	X
LR-16-T03N-BRT	9/23/03	SA	543948	B	X	X
LR-16-T01N-BMI	9/23/03	SA	543949	B	X	
LR-16-T01N-PLA	9/23/03	SA	543950	B	X	
RR-11A1-T01N-BRT	9/23/03	SA	543951	B	X	X
RR-11A1-T02N-BRT	9/23/03	SA	543952	B	X	X
RR-11A1-T03N-BRT	9/23/03	SA	543953	B	X	X
RR-11A1-T01N-YOY	9/23/03	SA	543954	B	X	X
RR-11A1-T01N-PLA	9/23/03	SA	543955	B	X	
RR-11A1-T01N-BMI	9/23/03	SA	543956	B	X	
EB051	9/22/03	EB	543957	W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank EB = Laboratory Equipment Blank FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

Equipment Blanks were generated by the laboratory during the tissue homogenization step of sample preparation for biota samples. These blanks were processed with the samples and were evaluated as an additional Method Blank associated with the samples.

All sample results are reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms indicate %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired. However, no %Solids were performed for sample RR-11A1-T01N-YOY due to insufficient sample.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks • Calibration Blanks	No	Various metals were detected in the homogenization (equipment) blank, the metals preparation blanks, and continuing calibration blanks. Table 1.1 summarizes the metals blank detections and the resultant data qualifications (limited to those samples and analytes requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS LR-16-T03N-BRT • PDS LR-16-T03N-BRT • LD LR-16-T03N-BRT	No	The matrix spike concentrations were within 4x the sample concentrations and, therefore appropriate for assessing accuracy. The matrix spike recoveries were within the QC acceptance criteria of 75 – 125% with the exception of selenium and zinc (recoveries were 6.4% and 143.1%, respectively). The positive results in the parent sample were qualified as estimated with an indeterminate bias. The post-digestion spike and the lab duplicate results were within QC criteria for all metals. The lab duplicate results were within QC criteria for all metals. The matrix quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Method QC • Serial Dilution LR-16-T03N-BRT • Internal Standards	No	The serial dilution analyses were not applicable for 22 metals with original results less than 50 times the IDL. For the remaining two (2) metals (calcium and potassium), the percent difference between the original results and the results for a 5-fold dilution exceeded the ≤10% criterion for calcium only (24.8%). The affected analyte was qualified as estimated with low bias, in the parent sample (J, DL-L). The method quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Field QC • Field Duplicate • Rinsate Blank • Other (e.g. Splits)	N/A	No field duplicate samples were included in this SDG. Rinsate blanks, if any, were analyzed and reported with water samples, and will be evaluated at a later date. The field QC results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 10-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.

Review Parameter	Criteria Met?	Comments
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Laboratory Control Samples (LCSs) • Continuing Calibration Verifications (CCVs) • Interference Check Sample Results (ICSs) All LCS and CCV recoveries associated with project samples were within acceptance limits. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Aluminum (P)		6.39		22.1	LR-16-T01N-BRT1 LR-16-T02N-BRT1 LR-16-T03N-BRT1 LR-16-T03N-BRT2 LR-16-T01N-YOY LR-16-T02N-YOY LR-16-T03N-YOY LR-16-T01N-BRT RR-11A1-T01N-BRT RR-11A1-T02N-BRT RR-11A1-T03N-BRT	U MB-I
Chromium (MS)		1.191	0.28	0.20	LR-16-T01N-BRT1 LR-16-T02N-BRT1 LR-16-T03N-BRT1 LR-16-T01N-BRT2 LR-16-T02N-BRT2 LR-16-T03N-BRT2 LR-16-T01N-YOY LR-16-T02N-YOY LR-16-T03N-YOY LR-16-T01N-BRT LR-16-T02N-BRT LR-16-T03N-BRT LR-16-T01N-BMI LR-16-T01N-PLA RR-11A1-T01N-BRT RR-11A1-T02N-BRT RR-11A1-T03N-BRT RR-11A1-T01N-YOY RR-11A1-T01N-PLA RR-11A1-T01N-BMI	U MB-I

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Lead (P)		0.27		1.4	LR-16-T01N-BRT1 LR-16-T02N-BRT1 LR-16-T03N-BRT1 LR-16-T01N-BRT2 LR-16-T02N-BRT2 LR-16-T03N-BRT2 LR-16-T01N-YOY LR-16-T02N-YOY LR-16-T03N-YOY LR-16-T01N-BRT LR-16-T02N-BRT LR-16-T03N-BRT LR-16-T01N-BMI RR-11A1-T01N-BRT RR-11A1-T02N-BRT RR-11A1-T01N-YOY	U MB-I
Molybdenum (P)		0.135		1.1	LR-16-T01N-BRT1 LR-16-T02N-BRT1 LR-16-T03N-BRT1 LR-16-T02N-BRT2 LR-16-T01N-YOY LR-16-T02N-YOY LR-16-T03N-YOY LR-16-T02N-BRT LR-16-T03N-BRT RR-11A1-T01N-BRT RR-11A1-T02N-BRT RR-11A1-T03N-BRT RR-11A1-T01N-YOY RR-11A1-T01N-BMI	U MB-I
Nickel (P)		-0.328		2.4	LR-16-T01N-BRT1 LR-16-T02N-BRT1 LR-16-T03N-BRT1 LR-16-T01N-BRT2 LR-16-T02N-BRT2 LR-16-T03N-BRT2 LR-16-T01N-YOY LR-16-T02N-YOY LR-16-T03N-YOY LR-16-T01N-BRT LR-16-T03N-BRT RR-11A1-T01N-BRT RR-11A1-T02N-BRT RR-11A1-T03N-BRT RR-11A1-T01N-YOY	J / UJ MB-L

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Silver (P)		-0.172		1.6	LR-16-T01N-BRT1 LR-16-T02N-BRT1 LR-16-T03N-BRT1 LR-16-T01N-BRT2 LR-16-T02N-BRT2 LR-16-T03N-BRT2 LR-16-T01N-YOY LR-16-T02N-YOY LR-16-T03N-YOY LR-16-T01N-BRT LR-16-T02N-BRT LR-16-T03N-BRT LR-16-T01N-BMI LR-16-T01N-PLA RR-11A1-T01N-BRT RR-11A1-T02N-BRT RR-11A1-T03N-BRT RR-11A1-T01N-YOY RR-11A1-T01N-PLA RR-11A1-T01N-BMI	J / UJ MB-L
Sodium (P)		111	139	453.8	LR-16-T01N-BRT2 LR-16-T02N-BRT2 LR-16-T03N-BRT2 LR-16-T01N-PLA RR-11A1-T01N-PLA	U MB-I

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO052 Sampling Event: Fall 2003

Matrix: Soil ☐ Sediment ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Kathie Teuscher Date Completed: 11/18/03

Peer Reviewer: Peggy Schuler Date Completed: 11/19/03

The table below summarizes the results presented in this data package.

Field ID	Sample Date	QC Type	Lab ID	Matrix	Analyses	
					Metals	%Lipids
LR-8A-T01N-BRT	9/24/03	SA	543958	B	X	X
LR-8A-T02N-BRT	9/24/03	SA	543959	B	X	X
LR-8A-T03N-BRT	9/24/03	SA	543960	B	X	X
LR-8A-T01N-YOY	9/24/03	SA	543961	B	X	X
LR-8A-T02N-YOY	9/24/03	SA	543962	B	X	X
LR-8A-T03N-YOY	9/24/03	SA	543963	B	X	X
LR-8A-T01N-PLA	9/24/03	SA	543964	B	X	X
LR-8A-T01N-BMI	9/24/03	SA	543965	B	X	
EB052	9/24/03	EB	543966	B	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank EB = Laboratory Equipment Blank FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

The case narrative indicated that laboratory duplicate analysis for sample LR-8A-T01N-PLA yielded a Relative Percent Difference (RPD) for molybdenum was 36.1%, which exceeded criteria. However, in accordance with the QAPP, the appropriate criterion for the biota matrix is 50%. Therefore, the result was considered acceptable and no qualification was necessary.

Equipment Blanks were generated by the laboratory during the tissue homogenization step of sample preparation for biota samples. These blanks were processed with the samples and were evaluated as an additional Method Blank associated with the samples.

All sample results are reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms indicate %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specificParameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks • Calibration Blanks	No	Various metals were detected in the homogenization (equipment) blank, the metals preparation blanks, and continuing calibration blanks. Table 1.1 summarizes the metals blank detections and the resultant data qualifications (limited to those samples and analytes requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS LR-8A-T01N-PLA • PDS LR-8A-T01N-PLA • LD LR-8A-T01N-PLA	No	The matrix spike concentrations were less than ¼ the native sample concentrations for aluminum, iron, manganese, and zinc, and were therefore inappropriate for assessing accuracy. For the remaining elements, the matrix spike recoveries were within the QC acceptance criteria of 75 – 125% with the exception of antimony and selenium (recoveries were 70.6% and 70.4%, respectively). The results in the parent sample were qualified as estimated with a low bias. The post-digestion spike and the lab duplicate results were within QC criteria for all metals. The lab duplicate results were within QC criteria for all metals except selenium. The result in the parent sample was qualified as estimated with an indeterminate bias. The matrix quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Method QC • Serial Dilution LR-8A-T01N-PLA • Internal Standards	Yes	The serial dilution analyses were not applicable for 13 metals with original results less than 50 times the IDL. For the remaining 11 metals (Al, Ba, Ca, Co, Cu, Fe, Pb, Mg, Mo, Ni, Zn), the percent difference between the original results and the results for a 5-fold dilution were within the ≤10% criterion. The method quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Field QC • Field Duplicate • Rinsate Blank • Other (e.g. Splits)	Yes	No field duplicate samples were included in this SDG. Rinsate blanks, if any, were analyzed and reported with water samples, and will be evaluated at a later date. The field QC results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 10-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specificParameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Laboratory Control Samples (LCSs) • Continuing Calibration Verifications (CCVs) • Interference Check Sample Results (ICSs) All LCS and CCV recoveries associated with project samples were within acceptance limits with exception of boron. Boron recovery for CCV3 was 112.1%, indicating a positive bias. However, all associated samples were nondetect or qualified as nondetect due to laboratory contamination. Therefore, no additional qualification was required. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Boron (P)		1.151		6.3	LR-8A-T01N-BRT LR-8A-T01N-PLA LR-8A-T01N-BMI	U MB-I
Copper (P)		1.707	1.900	2.2	LR-8A-T01N-BRT LR-8A-T02N-BRT LR-8A-T03N-BRT LR-8A-T01N-YOY LR-8A-T02N-YOY LR-8A-T03N-YOY	U MB-I
Lead (P)		0.207		1.4	LR-8A-T01N-BRT LR-8A-T02N-BRT LR-8A-T03N-BRT LR-8A-T01N-YOY LR-8A-T02N-YOY LR-8A-T03N-YOY	U MB-I
Molybdenum (P)	1.8 and 2.0	0.13		1.1	LR-8A-T01N-BRT LR-8A-T02N-BRT LR-8A-T03N-BRT LR-8A-T01N-YOY LR-8A-T02N-YOY LR-8A-T03N-YOY	U CCB, MB-I

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Nickel (P)		-0.29		2.4	LR-8A-T01N-BRT LR-8A-T02N-BRT LR-8A-T01N-YOY LR-8A-T02N-YOY LR-8A-T03N-YOY	J / UJ MB-L
Silver (P)		-0.164		1.6	LR-8A-T01N-BRT LR-8A-T02N-BRT LR-8A-T03N-BRT LR-8A-T01N-YOY LR-8A-T02N-YOY LR-8A-T03N-YOY LR-8A-T01N-PLA LR-8A-T01N-BMI	UJ MB-L
Sodium (P)		127.1	137	453.8	LR-8A-T01N-PLA	U MB-I

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO053 Sampling Event: Fall 2003

Matrix: Soil ☐ Sediment ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Peggy Schuler Date Completed: 11/11/03

Peer Reviewer: Kathie Teuscher Date Completed: 11/12/03

The table below summarizes the results presented in this data package.

Field ID	Sample Date	QC Type	Lab ID	Matrix	Analyses	
					Metals	%Lipids
RR-6-T01N-BMI	09/30/2003	SA	545982	B	X	
CABRESTO-T01N-BRT1	09/26/2003	SA	545983	B	X	X
CABRESTO-T01N-BRT2	09/26/2003	SA	545984	B	X	X
CABRESTO-T02N-BRT1	09/26/2003	SA	545985	B	X	X
CABRESTO-T02N-BRT2	09/26/2003	SA	545986	B	X	X
CABRESTO-T03N-BRT1	09/26/2003	SA	545987	B	X	X
CABRESTO-T03N-BRT2	09/26/2003	SA	545988	B	X	X
CABRESTO-T01N-BRT	09/26/2003	SA	545989	B	X	X
CABRESTO-T02N-BRT	09/26/2003	SA	545990	B	X	X
CABRESTO-T03N-BRT	09/26/2003	SA	545991	B	X	X
CABRESTO-T01N-YOY	09/26/2003	SA	545992	B	X	X
CABRESTO-T02N-YOY	09/26/2003	SA	545993	B	X	X
CABRESTO-T03N-YOY	09/26/2003	SA	545994	B	X	X
CABRESTO-T01N-PLA	09/26/2003	SA	545995	B	X	
CABRESTO-T01N-BMI	09/26/2003	SA	545996	B	X	
EB053	09/26/2003	EB	545997	W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank EB = Laboratory Equipment Blank FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

Equipment Blanks were generated by the laboratory during the tissue homogenization step of sample preparation for biota samples. These blanks were processed with the samples and were evaluated as an additional Method Blank associated with the samples.

All sample results are reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms indicate %Solids = 100% and that results are dry weight. Percent solids analyses

were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks • Calibration Blanks	No	Various metals were detected in the homogenization (equipment) blank, the metals preparation blanks, and continuing calibration blanks. Table 1.1 summarizes the metals blank detections and the resultant data qualifications (limited to those samples and analytes requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC CABRESTO-T01N-BRT1 • MS • PDS • LD	No	The matrix spike concentrations were within 4x the sample concentrations and, therefore appropriate for assessing accuracy. Selected matrix spike recoveries were outside the QC acceptance criteria of 75 – 125%. Table 1.2 summarizes the matrix spike recoveries and the resultant data qualifications (limited to the parent sample). The post-digestion spike results were within QC criteria for all metals. The lab duplicate exceeded criteria for calcium (RPD = 82%). The result for the parent sample was qualified as estimated with an indeterminate bias. The matrix quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Method QC • Serial Dilution CABRESTO-T01N-BRT1 • Internal Standards	No	The serial dilution analyses were not applicable for 20 metals with original results less than 50 times the IDL. For the remaining four (4) metals (calcium, chromium, potassium, and zinc), the percent difference between the original results and the results for a 5-fold dilution exceeded the ≤10% criterion for potassium only (14.0%). The potassium result in sample CABRESTO-T01N-BRT1 was therefore qualified as estimated with low bias. The method quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Field QC • Field Duplicate • Rinsate Blank • Other (e.g. Splits)	N/A	No field duplicate pairs were submitted with this SDG. Rinsate blanks, if any, were analyzed and reported with water samples, and will be evaluated at a later date. The field QC results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 10-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Laboratory Control Samples (LCSs) • Continuing Calibration Verifications (CCVs) • Interference Check Sample Results (ICSs) All LCS and CCV recoveries associated with project samples were within acceptance limits. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Aluminum (P)	47.4, 26.2 (CCB1, 4)	8.533	3.1	22.1	CABRESTO-T01N-BRT CABRESTO-T01N-BRT1 CABRESTO-T01N-BRT2 CABRESTO-T01N-YOY CABRESTO-T02N-BRT CABRESTO-T02N-BRT2 CABRESTO-T02N-YOY CABRESTO-T03N-BRT CABRESTO-T03N-BRT1 CABRESTO-T03N-YOY	U MB – I or U MB, CCB – I
Boron (P)		1.08		6.3	CABRESTO-T01N-BMI CABRESTO-T01N-BRT1 CABRESTO-T01N-BRT2 CABRESTO-T01N-PLA RR-6-T01N-BMI	U MB – I

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Copper (P)		1.887	1.9	2.2	CABRESTO-T01N-BMI CABRESTO-T01N-BRT CABRESTO-T01N-BRT1 CABRESTO-T01N-BRT2 CABRESTO-T01N-PLA CABRESTO-T01N-YOY CABRESTO-T02N-BRT CABRESTO-T02N-BRT1 CABRESTO-T02N-BRT2 CABRESTO-T02N-YOY CABRESTO-T03N-BRT CABRESTO-T03N-BRT1 CABRESTO-T03N-BRT2 CABRESTO-T03N-YOY	U MB – I
Iron (P)	37.8 (CCB1)	3.55		27.8	CABRESTO-T01N-BRT CABRESTO-T01N-BRT2 CABRESTO-T02N-BRT2 CABRESTO-T03N-BRT2	U MB – I or U MB, CCB – I
Lead (P)		0.232	0.18	1.4	CABRESTO-T01N-BMI CABRESTO-T01N-BRT CABRESTO-T01N-BRT1 CABRESTO-T01N-BRT2 CABRESTO-T01N-YOY CABRESTO-T02N-BRT CABRESTO-T02N-BRT1 CABRESTO-T02N-YOY CABRESTO-T03N-BRT CABRESTO-T03N-BRT1 CABRESTO-T03N-BRT2 CABRESTO-T03N-YOY	U MB – I
Molybdenum (P)	1.5 (CCB3)	0.145	0.13	1.1	CABRESTO-T01N-BMI CABRESTO-T01N-BRT CABRESTO-T01N-BRT1 CABRESTO-T01N-BRT2 CABRESTO-T01N-PLA CABRESTO-T01N-YOY CABRESTO-T02N-BRT CABRESTO-T02N-BRT1 CABRESTO-T02N-BRT2 CABRESTO-T03N-BRT CABRESTO-T03N-BRT1 CABRESTO-T03N-BRT2 CABRESTO-T03N-YOY RR-6-T01N-BMI	U MB – I or U MB, CCB – I

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Selenium (MS)	-4 (CCB6)	-0.638		0.3	CABRESTO-T01N-BMI CABRESTO-T01N-BRT CABRESTO-T01N-BRT1 CABRESTO-T01N-BRT2 CABRESTO-T01N-PLA CABRESTO-T01N-YOY CABRESTO-T02N-BRT CABRESTO-T02N-BRT1 CABRESTO-T02N-BRT2 CABRESTO-T02N-YOY CABRESTO-T03N-BRT CABRESTO-T03N-BRT1 CABRESTO-T03N-BRT2 CABRESTO-T03N-YOY RR-6-T01N-BMI	J MB – L or J MB, CCB – L
Silver (P)		-0.205		1.6	CABRESTO-T01N-BMI CABRESTO-T01N-BRT CABRESTO-T01N-BRT1 CABRESTO-T01N-BRT2 CABRESTO-T01N-PLA CABRESTO-T01N-YOY CABRESTO-T02N-BRT CABRESTO-T02N-BRT1 CABRESTO-T02N-BRT2 CABRESTO-T02N-YOY CABRESTO-T03N-BRT CABRESTO-T03N-BRT1 CABRESTO-T03N-BRT2 CABRESTO-T03N-YOY RR-6-T01N-BMI	UJ MB – L
Sodium (P)		131.5	145	453.8	CABRESTO-T01N-PLA CABRESTO-T02N-BRT2 CABRESTO-T03N-BRT2	U MB – I

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike Results Exceeding Acceptance Criteria
(conducted on sample CABRESTO-T01N-BRT1)

Analyte	MS % Rec	Lower QC Limit	Upper QC Limit	Qualification and Qualification Codes
Aluminum	141.6	75	125	None (sample ND)
Chromium	139.0	75	125	J MS – H
Iron	253.9	75	125	J MS – H
Mercury	67.5	75	125	J MS – L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO054 Sampling Event: Fall 2003

Matrix: Soil ☐ Sediment ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Kathie Teuscher Date Completed: 11/18/03

Peer Reviewer: Peggy Schuler Date Completed: 11/19/03

The table below summarizes the results presented in this data package.

Field ID	Sample Date	QC Type	Lab ID	Matrix	Analyses	
					Metals	%Lipids
RR-8-T01N-BRT1	9/30/2003	SA	546007	B	X	X
RR-8-T01N-BRT2	9/30/2003	SA	546008	B	X	X
RR-8-T02N-BRT1	9/30/2003	SA	546009	B	X	X
RR-8-T02N-BRT2	9/30/2003	SA	546010	B	X	X
RR-8-T03N-BRT1	9/30/2003	SA	546011	B	X	X
RR-8-T03N-BRT2	9/30/2003	SA	546012	B	X	X
RR-8-T01N-RBT1	9/30/2003	SA	546013	B	X	X
RR-8-T01N-RBT2	9/30/2003	SA	546014	B	X	X
RR-8-T01D-RBT2	9/30/2003	FD	546015	B	X	X
RR-8-T01N-BRT	9/30/2003	SA	546016	B	X	X
RR-8-T02N-BRT	9/30/2003	SA	546017	B	X	X
RR-8-T03N-BRT	9/30/2003	SA	546018	B	X	X
RR-8-T01N-PLA	9/30/2003	SA	546019	B	X	
RR-8-T01N-BMI	9/30/2003	SA	546020	B	X	
RR-7-T01N-PLA	9/30/2003	SA	546021	B	X	
RR-7-T01N-BMI	9/30/2003	SA	546022	B	X	
RR-6-T01N-PLA	9/30/2003	SA	546023	B	X	
EB054	9/30/2003	EB	546024	B	X	

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample RB = Rinsate Blank EB = Laboratory Equipment Blank FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

An Equipment Blank (EB054) was generated by the laboratory during the tissue homogenization step of sample preparation for biota samples. These blanks were processed with the samples and were evaluated as an additional Method Blank associated with the samples. The reporting limits for EB054 were

incorrectly reported as ug/l, rather than mg/kg. The laboratory revised the Form I accordingly and resubmitted.

All sample results are reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms indicate %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks • Calibration Blanks	No	Various metals were detected in the homogenization (equipment) blank, the metals preparation blanks, and continuing calibration blanks. Table 1.1 summarizes the metals blank detections and the resultant data qualifications (limited to those samples and analytes requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS RR-8-T01N-RBT1 • PDS RR-8-T01N-RBT1 • LD RR-8-T01N-RBT1	No	The matrix spike concentrations were within 4x the sample concentrations and, therefore appropriate for assessing accuracy. The matrix spike recoveries were within the QC acceptance criteria of 75 – 125% with the exception of antimony, arsenic, mercury, and thallium. Table 1.2 lists the associated recoveries and the resultant data qualifications. The post-digestion spike and the lab duplicate results were within QC criteria for all metals. The lab duplicate results were within QC criteria for all metals except calcium. The result for the parent sample was qualified as estimated with and indeterminate bias. The matrix quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Method QC • Serial Dilution • RR-8-T01N-RBT1 • Internal Standards	No	The serial dilution analyses were not applicable for 20 metals with original results less than 50 times the IDL. For the remaining four (4) metals (calcium, magnesium, potassium, and zinc), the percent difference between the original results and the results for a 5-fold dilution exceeded the ≤10% criterion for potassium only (10.9%). The affected analyte was qualified as estimated with low bias, in the parent sample (J, DL-L). The method quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Field QC • Field Duplicate RR-8-T01N/D-RBT2 • Rinsate Blank • Other (e.g. Splits)	Yes	The field duplicate samples were within QC criteria. Rinsate blanks, if any, were analyzed and reported with water samples, and will be evaluated at a later date. The field QC results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 10-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Laboratory Control Samples (LCSs) • Continuing Calibration Verifications (CCVs) • Interference Check Sample Results (ICSs) All LCS and CCV recoveries associated with project samples were within acceptance limits. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Aluminum (P)	26			22.1	RR-8-T01N-BRT1 RR-8-T02N-BRT1 RR-8-T03N-BRT1	U CCB-I
Boron (P)		0.779		6.3	RR-6-T01N-PLA	U MB-I
Chromium (MS)			0.68	0.20	RR-8-T01N-BRT1 RR-8-T01N-BRT2 RR-8-T02N-BRT1 RR-8-T02N-BRT2 RR-8-T03N-BRT1 RR-8-T03N-BRT2 RR-8-T01N-RBT1 RR-8-T01N-RBT2 RR-8-T01D-RBT2 RR-8-T01N-BRT RR-8-T02N-BRT RR-8-T03N-BRT RR-8-T01N-PLA RR-8-T01N-BMI RR-7-T01N-PLA RR-7-T01N-BMI RR-6-T01N-PLA	U MB-I

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Iron (P)	-35.8			27.8	RR-8-T01N-BRT2 RR-8-T02N-BRT2 RR-8-T03N-BRT2 RR-8-T01N-RBT2 RR-8-T01D-RBT2	J CCB – L
Lead (P)		0.245		1.4	RR-8-T01N-BRT1 RR-8-T02N-BRT1 RR-8-T03N-BRT2 RR-8-T01N-RBT1 RR-8-T01N-RBT2 RR-8-T02N-BRT RR-8-T03N-BRT	U MB-I
Manganese (P)			0.44	1.2	RR-8-T01N-BRT2 RR-8-T02N-BRT1 RR-8-T02N-BRT2 RR-8-T03N-BRT2 RR-8-T01N-RBT2 RR-8-T02N-BRT	U MB-I
Mercury (CV)	-0.1			0.10	RR-8-T01N-BRT1 RR-8-T01N-BRT2 RR-8-T02N-BRT1 RR-8-T02N-BRT2 RR-8-T03N-BRT1 RR-8-T03N-BRT2 RR-8-T01N-RBT1 RR-8-T01N-RBT2 RR-8-T01D-RBT2 RR-8-T01N-BRT RR-8-T02N-BRT RR-8-T03N-BRT RR-8-T01N-PLA RR-8-T01N-BMI RR-7-T01N-PLA RR-7-T01N-BMI RR-6-T01N-PLA	UJ CCB-L
Nickel (P)	-2.5 to -2.8	-0.442		2.4	RR-8-T01N-BRT1 RR-8-T01N-BRT2 RR-8-T02N-BRT1 RR-8-T02N-BRT2 RR-8-T03N-BRT1 RR-8-T03N-BRT2 RR-8-T01N-RBT1 RR-8-T01N-RBT2 RR-8-T01D-RBT2 RR-8-T01N-BRT RR-8-T02N-BRT RR-8-T03N-BRT	J / UJ CCB, MB-L

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Sodium (P)		124.6	129	453.8	RR-8-T01N-BRT2 RR-8-T02N-BRT2 RR-8-T01N-PLA RR-7-T01N-PLA RR-6-T01N-PLA	U MB-I

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike/Matrix Spike Duplicate Results Exceeding Acceptance Criteria
(conducted on sample RR-8-T01N-RBT1)

Analyte	MS % Recovery[1]	Lower QC Limit	Upper QC Limit	Qualification and Qualification Codes
Antimony	125.5	75	125	NA[2]
Arsenic	136.8	75	125	NA
Mercury	50.1	75	125	UJ MS-L
Thallium	131	75	125	NA

[1] Matrix Spike Duplicates (MSDs) were not performed for inorganic parameters.

[2] Not applicable. No qualification required for associated nondetect results if a high bias is demonstrated.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO055 Sampling Event: Fall 2003

Matrix: Soil ☐ Sediment ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Kathie Teuscher Date Completed: 11/20/03

Peer Reviewer: Peggy Schuler Date Completed: 11/24/03

The table below summarizes the results presented in this data package.

Field ID	Sample Date	QC Type	Lab ID	Matrix	Analyses	
					Metals	%Lipids
UFL1-T01N-WSA	10/1/2003	SA	546025	B	X	X
UFL1-T02N-WSA	10/1/2003	SA	546026	B	X	X
UFL1-T03N-WSA	10/1/2003	SA	546027	B	X	X
UFL1-T01N-BRT1	10/1/2003	SA	546028	B	X	X
UFL1-T01N-BRT2	10/1/2003	SA	546029	B	X	X
UFL1-T02N-BRT1	10/1/2003	SA	546030	B	X	X
UFL1-T02N-BRT2	10/1/2003	SA	546031	B	X	X
UFL1-T03N-BRT1	10/1/2003	SA	546032	B	X	X
UFL1-T03N-BRT2	10/1/2003	SA	546033	B	X	X
UFL1-T01N-WSJ	10/1/2003	SA	546034	B	X	X
UFL1-T02N-WSJ	10/1/2003	SA	546035	B	X	X
UFL1-T03N-WSJ	10/1/2003	SA	546036	B	X	X
UFL1-T01N-PLA	10/1/2003	SA	546037	B	X	
RR-4-T01N-BRT	10/1/2003	SA	546038	B	X	X
RR-4-T02N-BRT	10/1/2003	SA	546039	B	X	X
RR-4-T03N-BRT	10/1/2003	SA	546040	B	X	X
RR-4-T01N-YOY	10/1/2003	SA	546041	B	X	X
RR-4-T02N-YOY	10/1/2003	SA	546042	B	X	X
RR-4-T01N-BMI	10/1/2003	SA	546043	B	X	
RR-4-T01N-PLA	10/1/2003	SA	546044	B	X	
EB055	10/1/2003	EB	546045	B	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank EB = Laboratory Equipment Blank FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

The case narrative indicated that laboratory duplicate analysis for sample UFL1-T01N-BRT1 yielded a Relative Percent Difference (RPD) for calcium was 32.2%, which exceeded criteria. However, in accordance with the QAPP, the appropriate criterion for the biota matrix is 50%. Therefore, the result was considered acceptable and no qualification was necessary.

An Equipment Blank (EB055) was generated by the laboratory during the tissue homogenization step of sample preparation for biota samples. These blanks were processed with the samples and were evaluated as an additional Method Blank associated with the samples. The reporting limits for EB055 were incorrectly reported as ug/l, rather than mg/kg. The laboratory revised the Form I accordingly and resubmitted.

All sample results are reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms indicate %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks • Calibration Blanks	No	Various metals were detected in the homogenization (equipment) blank, the metals preparation blanks, and continuing calibration blanks. Table 1.1 summarizes the metals blank detections and the resultant data qualifications (limited to those samples and analytes requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS UFL1-T01N-BRT1 • PDS UFL1-T01N-BRT1 • LD UFL1-T01N-BRT1	No	The matrix spike concentrations were within 4x the sample concentrations and, therefore appropriate for assessing accuracy. The matrix spike recoveries were within the QC acceptance criteria of 75 – 125% with the exception of arsenic, mercury, and selenium. Table 1.2 lists the associated recoveries and the resultant data qualifications. The post-digestion spike results were within QC criteria for all metals. The lab duplicate results were within QC criteria for all metals except zinc (RPD = 58%). The result for the parent sample was qualified as estimated with and indeterminate bias. The matrix quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Method QC • Serial Dilution UFL1-T01N-BRT1 • Internal Standards	No	The serial dilution analyses were not applicable for 21 metals with original results less than 50 times the IDL. For the remaining three (3) metals (calcium, potassium, and zinc), the percent difference between the original results and the results for a 5-fold dilution exceeded the ≤10% criterion for potassium only (17%). The affected analyte was qualified as estimated with low bias, in the parent sample (J, DL-L). The method quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank • Other (e.g. Splits)	N/A	No field duplicate samples were included in this SDG. Rinsate blanks, if any, were analyzed and reported with water samples, and will be evaluated at a later date. The field QC results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 10-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Laboratory Control Samples (LCSs) • Continuing Calibration Verifications (CCVs) • Interference Check Sample Results (ICSs) All LCS and CCV recoveries associated with project samples were within acceptance limits. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Boron (P)		0.764		6.3	UFL1-T01N-PLA RR-4-T01N-BMI RR-4-T01N-PLA	U MB-I
Chromium (P)	-1.2			1.1	UFL1-T02N-BRT1 UFL1-T02N-BRT2 UFL1-T01N-WSJ	J CCB-L
Lead (P)	-1.4	0.191	0.32	1.4	UFL1-T01N-WSA UFL1-T02N-WSA UFL1-T03N-WSA UFL1-T01N-BRT1 UFL1-T01N-BRT2 UFL1-T02N-BRT1 UFL1-T02N-BRT2 UFL1-T03N-BRT1 UFL1-T01N-WSJ UFL1-T02N-WSJ UFL1-T03N-WSJ RR-4-T01N-BRT RR-4-T02N-BRT RR-4-T03N-BRT RR-4-T01N-YOY RR-4-T02N-YOY RR-4-T01N-BMI	U MB-I
Nickel (P)	-2.5	-0.414		2.4	UFL1-T01N-WSA UFL1-T03N-WSA UFL1-T01N-BRT1 UFL1-T01N-BRT2 UFL1-T02N-BRT1 UFL1-T02N-BRT2 UFL1-T03N-BRT1 UFL1-T03N-BRT2 UFL1-T01N-WSJ RR-4-T01N-BRT RR-4-T02N-BRT RR-4-T01N-YOY RR-4-T02N-YOY	UJ CCB,MB-L UJ CCB,MB-L UJ CCB,MB-L UJ CCB,MB-L UJ CCB,MB-L UJ CCB,MB-L UJ CCB,MB-L UJ CCB,MB-L UJ CCB,MB-L J CCB,MB-L J MB-L J MB-L J MB-L
Sodium (P)		94.13	112	453.8	UFL1-T01N-BRT2 UFL1-T03N-BRT2 UFL1-T01N-PLA RR-4-T01N-PLA	U MB-I

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike/Matrix Spike Duplicate Results Exceeding Acceptance Criteria
(conducted on sample UFL1--T01N-BRT1)

Analyte	MS % Recovery[1]	Lower QC Limit	Upper QC Limit	Qualification and Qualification Codes
Arsenic	129.1	75	125	NA[2]
Mercury	58.6	75	125	UJ MS-L
Selenium	165.6	75	125	J MS-H

[1] Matrix Spike Duplicates (MSDs) were not performed for inorganic parameters.

[2] Not applicable. No qualification required for associated nondetect results if a high bias is demonstrated.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO056 Sampling Event: Fall 2003

Matrix: Soil ☐ Sediment ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Kathie Teuscher Date Completed: 11/21/03

Peer Reviewer: Peggy Schuler Date Completed: 11/21/03

The table below summarizes the results presented in this data package.

Field ID	Sample Date	QC Type	Lab ID	Matrix	Analyses	
					Metals	%Lipids
RR-5-T01N-BRT1	10/1/03	SA	546046	B	X	X
RR-5-T01N-BRT2	10/1/03	SA	546047	B	X	X
RR-5-T02N-BRT1	10/1/03	SA	546048	B	X	X
RR-5-T02N-BRT2	10/1/03	SA	546049	B	X	X
RR-5-T01N-BRT	10/1/03	SA	546050	B	X	X
RR-5-T02N-BRT	10/1/03	SA	546051	B	X	X
RR-5-T03N-BRT	10/1/03	SA	546052	B	X	X
RR-5-T01N-YOY	10/1/03	SA	546053	B	X	X
RR-5-T01N-PLA	10/1/03	SA	546054	B	X	
RR-5-T01N-BMI	10/1/03	SA	546055	B	X	
ERL1-T01N-WSA	10/1/03	SA	546056	B	X	X
ERL1-T02N-WSA	10/2/03	SA	546057	B	X	X
ERL1-T03N-WSA	10/2/03	SA	546058	B	X	X
ERL1-T01N-WSJ	10/2/03	SA	546059	B	X	X
ERL1-T02N-WSJ	10/2/03	SA	546060	B	X	X
ERL1-T03N-WSJ	10/2/03	SA	546061	B	X	X
ERL1-T01N-WSY	10/2/03	SA	546062	B	X	X
ERL1-T02N-WSY	10/2/03	SA	546063	B	X	X
EB056		EB	546064	W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank EB = Laboratory Equipment Blank FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

An Equipment Blank (EB056) was generated by the laboratory during the tissue homogenization step of sample preparation for biota samples. This blank was processed with the samples and was evaluated as an additional Method Blank associated with the samples.

All sample results are reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms indicate %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks • Calibration Blanks	No	Various metals were detected in the homogenization (equipment) blank, the metals preparation blanks, and continuing calibration blanks. Table 1.1 summarizes the metals blank detections and the resultant data qualifications (limited to those samples and analytes requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS ERL1-T01N-WSA • PDS ERL1-T01N-WSA • LD ERL1-T01N-WSA	No	The matrix spike concentrations were within 4x the sample concentrations and, therefore, appropriate for assessing accuracy. The matrix spike recoveries were within the QC acceptance criteria of 75 – 125% with the exception of mercury and selenium. Table 1.2 lists the associated recoveries and the resultant data qualifications. The post-digestion spike and the lab duplicate results were within QC criteria for all metals. The matrix quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Method QC • Serial Dilution ERL1-T01N-WSA • Internal Standards	Yes	The serial dilution analyses were not applicable for 20 metals with original results less than 50 times the IDL. For the remaining four (4) metals (arsenic, potassium, sodium, and zinc), the percent difference between the original results and the results for a 5-fold dilution met the ≤10% criterion. The method quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Field QC • Field Duplicate • Rinsate Blank • Other (e.g. Splits)	N/A	No field duplicate samples were included in this SDG. Rinsate blanks, if any, were analyzed and reported with water samples, and will be evaluated at a later date. The field QC results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 10-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Laboratory Control Samples (LCSs) • Continuing Calibration Verifications (CCVs) • Interference Check Sample Results (ICSs) All LCS and CCV recoveries associated with project samples were within acceptance limits. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Boron (P)		1.076		6.4	RR-5-T01N-PLA RR-5-T01N-BMI	U MB-I
Chromium (P)			0.24	2.3	RR-5-T02N-BRT1 RR-5-T01N-BRT RR-5-T02N-BRT RR-5-T03N-BRT RR-5-T01N-YOY ERL1-T03N-WSA ERL1-T02N-WSJ ERL1-T03N-WSJ ERL1-T01N-WSY	U MB-I
Molybdenum (P)	-2.4			2.2	ERL1-T02N-WSJ ERL1-T03N-WSJ ERL1-T01N-WSY ERL1-T02N-WSY	U CCB-L

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike Results Exceeding Acceptance Criteria
(conducted on sample ERL1-T01N-WSA)

Analyte	MS % Recovery	Lower QC Limit	Upper QC Limit	Qualification and Qualification Codes
Mercury	53.1	75	125	UJ MS-L
Selenium	69.1	75	125	J MS-L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO057 Sampling Event: Fall 2003

Matrix: Soil ☐ Sediment ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Kathie Teuscher Date Completed: 11/21/03

Peer Reviewer: Peggy Schuler Date Completed: 11/25/03

The table below summarizes the results presented in this data package.

Field ID	Sample Date	QC Type	Lab ID	Matrix	Analyses	
					Metals	%Lipids
ERL1-T03N-WSY	10/2/03	SA	546065	B	X	X
ERL1-T01N-PLA	10/2/03	SA	546066	B	X	
ZWERGLE-T01N-BRT1	10/2/03	SA	546067	B	X	X
ZWERGLE-T01N-BRT2	10/2/03	SA	546068	B	X	X
ZWERGLE-T02N-BRT1	10/2/03	SA	546069	B	X	X
ZWERGLE-T02N-BRT2	10/2/03	SA	546070	B	X	X
ZWERGLE-T03N-BRT1	10/2/03	SA	546071	B	X	X
ZWERGLE-T03N-BRT2	10/2/03	SA	546072	B	X	X
ZWERGLE-T01N-BRT	10/2/03	SA	546073	B	X	X
ZWERGLE-T02N-BRT	10/2/03	SA	546074	B	X	X
ZWERGLE-T03N-BRT	10/2/03	SA	546075	B	X	X
ZWERGLE-T01N-YOY	10/2/03	SA	546076	B	X	X
ZWERGLE-T02N-YOY	10/2/03	SA	546077	B	X	X
ZWERGLE-T03N-YOY	10/2/03	SA	546078	B	X	X
ZWERGLE-T01N-PLA	10/2/03	SA	546079	B	X	
ZWERGLE-T01N-BMI	10/2/03	SA	546080	B	X	
EB057		EB	546081	W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank EB = Laboratory Equipment Blank FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

An Equipment Blank (EB057) was generated by the laboratory during the tissue homogenization step of sample preparation for biota samples. This blank was processed with the samples and was evaluated as an additional Method Blank associated with the samples.

All sample results are reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms indicate %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks • Calibration Blanks	No	Various metals were detected in the homogenization (equipment) blank, the metals preparation blanks, and continuing calibration blanks. Table 1.1 summarizes the metals blank detections and the resultant data qualifications (limited to those samples and analytes requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS ZWERGLE-T01N-BRT1 • PDS ZWERGLE-T01N-BRT1 • LD ZWERGLE-T01N-BRT1	No	The matrix spike concentrations were within 4x the sample concentrations and, therefore, appropriate for assessing accuracy. The matrix spike recoveries were within the QC acceptance criteria of 75 – 125% with the exception of iron (2.6%). The result in the parent sample was qualified as estimated with a low bias. The post-digestion spike results were within QC criteria for all metals. The lab duplicate results were within QC criteria for all metals except iron. The result in the parent sample was qualified as estimated with an indeterminate bias. The matrix quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Method QC • Serial Dilution ZWERGLE-T01N-BRT1 • Internal Standards	Yes	The serial dilution analyses were not applicable for 20 metals with original results less than 50 times the IDL. For the remaining four (4) metals (calcium, iron, potassium, and zinc), the percent difference between the original results and the results for a 5-fold dilution exceeded the ≤10% criterion for iron and potassium (21.5% and 14.3%, respectively). The results in the parent sample were qualified as estimated with a low bias. The method quality control results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Field QC • Field Duplicate • Rinsate Blank • Other (e.g. Splits)	N/A	No field duplicate samples were included in this SDG. Rinsate blanks, if any, were analyzed and reported with water samples, and will be evaluated at a later date. The field QC results for the Fall 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Fall 2003 sampling event.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 10-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Laboratory Control Samples (LCSs) • Continuing Calibration Verifications (CCVs) • Interference Check Sample Results (ICSs) All LCS and CCV recoveries associated with project samples were within acceptance limits with the exception of CCV3 for nickel. The recovery was 89.4%, slightly below the 90% recovery. Associated sample results were qualified as estimated with a low bias. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Boron (P)		1.63		6.4	ERL1-T03N-WSY ERL1-T01N-PLA ZWERGLE-T01N-PLA ZWERGLE-T01N-BMI	U MB-I
Copper (P)	-2.4		0.24	2.2	ZWERGLE-T02N-BRT2 ZWERGLE-T03N-BRT2 ZWERGLE-T01N-BRT ZWERGLE-T02N-BRT ZWERGLE-T01N-YOY ZWERGLE-T02N-YOY ZWERGLE-T03N-YOY	J CCB-L
Iron (P)	-72.3 to -91.7	-8.935		27.8	ZWERGLE-T01N-BRT2 ZWERGLE-T02N-BRT2 ZWERGLE-T03N-BRT2 ZWERGLE-T01N-YOY ZWERGLE-T02N-YOY	J / UJ CCB, MB-L
Manganese (P)	-2.2 to -2.4	-0.154		1.2	ZWERGLE-T01N-BRT2 ZWERGLE-T02N-BRT2 ZWERGLE-T03N-BRT2	J CCB, MB-L

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Molybdenum (P)	1.6	0.128		1.1	ERL1-T03N-WSY	U MB-I
					ERL1-T01N-PLA	U MB-I
					ZWERGLE-T01N-BRT1	U MB-I
					ZWERGLE-T01N-BRT2	U MB-I
					ZWERGLE-T03N-BRT2	U MB-I
					ZWERGLE-T01N-BRT	U MB-I
					ZWERGLE-T02N-BRT	U MB-I
					ZWERGLE-T03N-BRT	U MB-I
					ZWERGLE-T01N-YOY	U MB-I
					ZWERGLE-T03N-YOY	U MB-I
					ZWERGLE-T01N-PLA	U CCB, MB-I
					ZWERGLE-T01N-BMI	U CCB, MB-I
Mercury (CV)	-0.1			0.10	ERL1-T03N-WSY	J / UJ CCB-L
					ERL1-T01N-PLA	
					ZWERGLE-T01N-BRT1	
					ZWERGLE-T01N-BRT2	
					ZWERGLE-T02N-BRT1	
					ZWERGLE-T02N-BRT2	
					ZWERGLE-T03N-BRT1	
					ZWERGLE-T03N-BRT2	
					ZWERGLE-T01N-BRT	
					ZWERGLE-T02N-BRT	
					ZWERGLE-T03N-BRT	
					ZWERGLE-T01N-YOY	
					ZWERGLE-T02N-YOY	
					ZWERGLE-T03N-YOY	
					ZWERGLE-T01N-PLA	
Nickel (P)		0.788		2.8	ERL1-T03N-WSY	U MB-I
					ZWERGLE-T03N-BRT2	
					ZWERGLE-T01N-BRT	
					ZWERGLE-T02N-BRT	
					ZWERGLE-T03N-BRT	
					ZWERGLE-T03N-YOY	
					ZWERGLE-T01N-PLA	
					ZWERGLE-T01N-BMI	
Sodium (P)		105.9		453.8	ERL1-T01N-PLA	U MB-I
					ZWERGLE-T03N-BRT2	
					ZWERGLE-T01N-PLA	

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE RI/FS PLANT SAMPLES COLLECTED DURING THE JUNE, AUGUST, AND SEPTEMBER 2003 SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004

URS

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139677

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Narratives 3-1

Section 4 Collective Summary/Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-3
4.3 Serial Dilution Results 4-3

Section 5 Collective Summary/Assessment of Field QC Results 5-1

5.1 Field Duplicate Results 5-1
5.2 Rinsate Blank Results 5-2

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-1
6.4 Representativeness 6-1
6.5 Comparability 6-2
6.6 Sensitivity 6-2

List of Tables

Table 1-1 Index to Location IDs and RI/FS IDs for Samples Collected During the Wildlife Impact Study

Table 1-2 Index to Location IDs and RI/FS IDs for Samples Collected During the Wildlife Impact Study

List of Attachments

Attachment 1.1 Data Review Summary for Data Package BIO037

Attachment 1.2 Data Review Summary for Data Package BIO038

Attachment 1.3 Data Review Summary for Data Package BIO039

Attachment 1.4 Data Review Summary for Data Package BIO040

Attachment 1.5 Data Review Summary for Data Package BIO041

Attachment 1.6 Data Review Summary for Data Package BIO042

Attachment 1.7 Data Review Summary for Data Package BIO047

This report contains the results of the data validation conducted for 75 RI/FS plant samples and associated quality control (QC) samples collected in June, August, and September of 2003 for the Molycorp RI/FS.

The RI/FS plant samples were reported in seven STL Burlington data packages (BIO037, BIO038, BIO039, BIO040, BIO041, BIO042, and BIO047). All samples were analyzed for total metals as described in the RI/FS QAPP. This data validation report describes the data validation process used and presents the data review results for the plant samples and associated QC samples submitted to STL Burlington for chemical analysis. The field sample IDs and associated data package numbers are provided in Table 1-1. A total of 52 plant samples applicable to the RI/FS were collected from sixteen locations as part of the Wildlife Impact Study (WIS). Therefore, samples were given WIS sample IDs. Table 1-2 presents an index to the location IDs and the applicable RI/FS and related to the WIS IDs. Data for these WIS sample IDs should be used, as appropriate, in data use for RI/FS tasks.

Table 1-1
Index to Location IDs and RI/FS IDs for Samples Collected During the Wildlife Impact Study

Data Package	Field ID Recorded on COC	QC Designation
BIO037	EB037	RB
	TSS14-10-T01N-PLTF	
	TSS14-10-T02N-PLTF	
	TSS14-7-T01N-PLTF	
	TSS14-7-T01N-PLTG	
	TSS14-7-T01N-PLTS	MS/LD/PDS/SD
	TSS14-7-T02N-PLTF	
	TSS14-7-T02N-PLTG	
	TSS14-7-T02N-PLTS	
	TSS14-8-T01N-PLTF	
	TSS14-8-T01N-PLTG	MS/LD/PDS/SD
	TSS14-8-T01N-PLTS	
	TSS14-8-T02N-PLTF	
	TSS14-8-T02N-PLTG	
	TSS14-8-T02N-PLTS	MS/LD/PDS/SD
	TSS14-9-T01N-PLTF	MS/LD/PDS/SD
	TSS14-9-T02N-PLTF	
BIO038	CR-10-T01N-PLTF	
	CR-10-T02N-PLTF	
	CR-5-T01N-PLTS	
	CR-5-T02D-PLTS	FD to CR-5-T02N-PLTS
	CR-5-T02N-PLTS	
	CR-7-T01D-PLTS	FD to CR-7-T01N-PLTS
	CR-7-T01N-PLTF	
	CR-7-T01N-PLTS	
	CR-7-T02N-PLTF	
	CR-7-T02N-PLTS	
	CR-8-T01N-PLTF	
	CR-8-T02N-PLTF	
	EB038	RB
	TSS14-6-T01N-PLTF	MS/LD/PDS/SD
	TSS14-6-T02N-PLTF	MS/LD/PDS/SD

Data Package	Field ID Recorded on COC	QC Designation
BIO039	CR-13-T01N-PLTF	
	CR-13-T02N-PLTF	
	CR-14-T01D-PLTS	FD to CR-14-T01N-PLTS
	CR-14-T01N-PLTF	
	CR-14-T01N-PLTG	
	CR-14-T01N-PLTS	
	CR-14-T02D-PLTF	FD to CR-14-T02N-PLTF
	CR-14-T02N-PLTF	
	CR-14-T02N-PLTG	
	CR-14-T02N-PLTS	
	CR-6-T01N-PLTG	
	CR-6-T01N-PLTS	MS/LD/PDS/SD
	CR-6-T02N-PLTG	
	CR-6-T02N-PLTS	MS/LD/PDS/SD
	EB039	RB
BIO040	CR-2-T01N-PLTS	
	CR-2-T02N-PLTS	
	TSS14-1-T01D-PLTF	FD to TSS14-1-T01N-PLTF
	TSS14-1-T01N-PLTF	
	TSS14-1-T01N-PLTS	
	TSS14-1-T02N-PLTF	
	TSS14-1-T02N-PLTS	
	TSS14-2-T01N-PLTF	SD
	TSS14-2-T02N-PLTF	
	TSS14-3-T01N-PLTF	
	TSS14-3-T02N-PLTF	
	TSS14-4-T01N-PLTF	
	TSS14-4-T01N-PLTG	
	TSS14-4-T02N-PLTF	
	TSS14-4-T02N-PLTG	
	TSS14-5-T01N-PLTF	
	TSS14-5-T02N-PLTF	
BIO041	CR-11-T01N-PLTF	
	CR-12-T02N-PLTF	
	EB041	RB
	RTBV-1-T01N-PLT	
	RMBV-2-T01D-PLT	FD to RMBV-2-T01N-PLT
	RMBV-2-T01N-PLT	
	RMBV-3-T01N-PLT	
	RRBV-1-T01N-PLT	SD
	RRBV-2-T01N-PLT	
	RRBV-3-T01N-PLT	
	RTBV-1-T01N-PLT	
	RTBV-2-T01N-PLT	
	RTBV-3-T01N-PLT	
BIO042	EB042	RB
	RTBV-4-T01N-PLT	SD
	RTBV-5-T01N-PLT	

Data Package	Field ID Recorded on COC	QC Designation
BIO047	EBLK047	
	RS-13A-T01D-PLTS	FD to RS-13A-T01N-PLTS
	RS-13A-T01N-PLTF	MS/LD/PDS/SD
	RS-13A-T01N-PLTG	
	RS-13A-T01N-PLTS	
	RS-13A-T02N-PLTF	
	RS-13A-T02N-PLTG	
	RS-13A-T02N-PLTS	

FD = Field Duplicate MS = Matrix Spike LD = Laboratory Duplicate
SD = Serial Dilution PDS- Post-Digestion Spike RB = Rinsate Blank

Table 1-2
Index to Location IDs and RI/FS IDs for Samples Collected During the Wildlife Impact Study

Location ID	RI/FS Sample ID	WIS Sample ID
CR-10	CR-10-T01N-PLTG	WRSD-3-T01N-PLTU
CR-10	CR-10-T02N-PLTG	WRSD-3-T02N-PLTU
CR-10	CR-10-T01N-PLTS	WRBS-3-T01N-PLTU
CR-10	CR-10-T02N-PLTS	WRBS-3-T02N-PLTU
CR-11	CR-11-T01N-PLTG	WRCW-2-T01N-PLTU
CR-11	CR-11-T02N-PLTG	WRCW-2-T02N-PLTU
CR-11	CR-11-T01N-PLTS	WRBS-1-T01N-PLTU
CR-11	CR-11-T02N-PLTS	WRBS-1-T02N-PLTU
CR-13	CR-13-T01N-PLTG	WRWW-2-T01N-PLTU
CR-13	CR-13-T02N-PLTG	WRWW-2-T02N-PLTU
CR-13	CR-13-T01N-PLTS	WRRR-3-T01N-PLTU
CR-13	CR-13-T02N-PLTS	WRRR-3-T02N-PLTU
CR-2	CR-2-T01N-PLTG	WRWW-1-T01N-PLTU
CR-2	CR-2-T02N-PLTG	WRWW-1-T02N-PLTU
+CR-4	CR-4-T01N-PLTG	WRWW-3-T01N-PLTU
CR-4	CR-4-T02N-PLTG	WRWW-3-T02N-PLTU
CR-4	CR-4-T01N-PLTS	WRRR-1-T01N-PLTU
CR-4	CR-4-T02N-PLTS	WRRR-1-T02N-PLTU
CR-5	CR-5-T01N-PLTG	WRSD-1-T01N-PLTU
CR-5	CR-5-T02N-PLTG	WRSD-1-T02N-PLTU
CR-7	CR-7-T01N-PLTG	WRSG-3-T01N-PLTU
CR-7	CR-7-T02N-PLTG	WRSG-3-T02N-PLTU
CR-8	CR-8-T01N-PLTG	WRBG-2-T01N-PLTU
CR-8	CR-8-T02N-PLTG	WRBG-2-T02N-PLTU
CR-8	CR-8-T01N-PLTS	WRBS-2-T01N-PLTU
CR-8	CR-8-T02N-PLTS	WRBS-2-T02N-PLTU
TSS14-1	TSS14-1-T01N-PLTG	WTSD-1-T01N-PLTU
TSS14-1	TSS14-1-T02N-PLTG	WTSD-1-T02N-PLTU
TSS14-10	TSS14-10-T01N-PLTG	WTWW-2-T02N-PLTW
TSS14-10	TSS14-10-T02N-PLTG	WTWW-2-T02N-PLTU
TSS14-10	TSS14-10-T01N-PLTS	WTBS-3-T01N-PLTU
TSS14-10	TSS14-10-T02N-PLTS	WTBS-3-T02N-PLTU
TSS14-2	TSS14-2-T01N-PLTG	WTSD-1-T01N-PLTU
TSS14-2	TSS14-2-T02N-PLTG	WTSD-1-T02N-PLTU

Location ID	RI/FS Sample ID	WIS Sample ID
TSS14-2	TSS14-2-T01N-PLTS	WTRR-1-T01N-PLTU
TSS14-2	TSS14-2-T02N-PLTS	WTRR-1-T02N-PLTU
TSS14-3	TSS14-3-T01N-PLTG	WTCW-2-T01N-PLTU
TSS14-3	TSS14-3-T02N-PLTG	WTCW-2-T02N-PLTU
TSS14-4	TSS14-4-T01N-PLTS	WTBS-1-T01N-PLTU
TSS14-4	TSS14-4-T02N-PLTS	WTBS-1-T02N-PLTU
TSS14-5	TSS14-5-T01N-PLTG	WTSD-2-T01N-PLTU
TSS14-5	TSS14-5-T02N-PLTG	WTSD-2-T02N-PLTU
TSS14-5	TSS14-5-T01N-PLTS	WTRR-2-T01N-PLTU
TSS14-5	TSS14-5-T02N-PLTS	WTRR-2-T02N-PLTU
TSS14-6	TSS14-6-T01N-PLTG	WTSG-1-T01N-PLTU
TSS14-6	TSS14-6-T02N-PLTG	WTSG-1-T02N-PLTU
TSS14-6	TSS14-6-T01N-PLTS	WWRR-3-T01N-PLTU
TSS14-6	TSS14-6-T02N-PLTS	WWRR-3-T02N-PLTU
TSS14-9	TSS14-9-T01N-PLTG	WTSG-2-T01N-PLTU
TSS14-9	TSS14-9-T02N-PLTG	WTSG-2-T02N-PLTU
TSS14-9	TSS14-9-T01N-PLTS	WTBS-2-T01N-PLTU
TSS14-9	TSS14-9-T02N-PLTS	WTBS-2-T02N-PLTU

Notes:

ID = Identification
RI/FS = Remedial Investigation/Feasibility Study
WIS = Wildlife Impact Study

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate or spike duplicate analysis, post-digestion spike recoveries, ICP serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, rinsate blanks, field blanks, and trip blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e.,verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1 and is as follows: if no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used; if no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used; if no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

In all cases of professional judgement exercised in evaluating the need for qualification, the basis for the professional judgement used is provided in the data review narrative. Section 3 provides the data review narratives for each of the data packages.

The site-specific matrix spike/matrix spike duplicate (MS/MSD) results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of

that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (MS/MSD results, laboratory duplicate results, and serial dilution results) and associated sample qualification. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries which are included in Attachment 1 along with data sheets marked with assigned data qualifiers and qualifier reason codes. The reason codes and bias codes are also stored in the electronic database.

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL Burlington data package BIO037 was used to evaluate laboratory performance criteria. If any problems were noted during review of the STL Burlington laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0.

The site-specific MS results, Laboratory Duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analyses, LD analyses, and the serial dilution results with the samples collected during the sampling event.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

The table below illustrates the site-samples that were used to prepare matrix spike samples. As ten MS sets were prepared and analyzed for 75 field samples (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
TSS14-9-T01N-PLTF	Plants	BIO037	Total Metals
TSS14-7-T01N-PLTS	Plants	BIO037	Total Metals
TSS14-8-T01N-PLTG	Plants	BIO037	Total Metals
TSS14-8-T02N-PLTG	Plants	BIO037	Total Metals
TSS14-6-T01N-PLTF	Plants	BIO038	Total Metals
TSS14-6-T02N-PLTF	Plants	BIO038	Total Metals
CR-6-T01N-PLTS	Plants	BIO039	Total Metals
CR-6-T02N-PLTS	Plants	BIO039	Total Metals
RRBV-1-T01N-PLT	Plants	BIO041	Total Metals
RS-13A-T01N-PLTF	Plants	BIO047	Total Metals

Fifteen of 220 spike recoveries (approximately 7%) were outside of the laboratory historical QC acceptance limits. For the sample results that were greater than four times the spike amount, the MS results were not appropriate for assessing accuracy and precision. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

Post-digestion spikes were conducted for all analytes to aid in determining whether the matrix spike results that were out of acceptance limits were caused by the sample matrix, a bias in the analytical system, or a combination of both. Recoveries for all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

The table below summarizes the results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Analyte	%R <75%	%R >125%	Number of Valid Spike Results	Average MS %R	Action
Aluminum	0	6	9	160.9	J MS-H All aluminum results except TSS14-7-T01N-PLTS, RRBV-1-T01N-PLT, RS-13A-T01N-PLTF
Antimony	1	0	10	94.9	J MS – L Parent sample only (TSS14-8-T02N-PLTG)
Arsenic	0	0	10	104.9	None
Barium	0	0	10	102.5	None
Beryllium	0	0	10	104.7	None
Boron	0	0	10	104.6	None
Cadmium	0	0	10	102.1	None
Chromium	0	0	10	104.5	None
Copper	0	0	10	109.2	None
Iron	0	4	7	130.9	J MS-H All iron results except TSS14-7-T01N-PLTS, RRBV-1-T01N-PLT, and RS-13A-T01N-PLTF
Lead	0	1	9	105.6	J MS-H Parent Sample (TSS14-9-T01N-PLTF) Only
Manganese	0	0	9	107.7	None
Mercury	0	0	10	109.2	None
Molybdenum	0	0	10	105.5	None
Selenium	1	2	10	109.2	J/UJ MS-L Parent Sample (TSS14-6-T02N-PLTF) Only For Parent Samples CR-6-T01N-PLTS and CR-6-T02N-PLTS the potential bias was high, and results were non-detect. Therefore, no data were qualified.
Nickel	0	0	10	99.2	None
Thallium	0	0	10	107.4	None
Silver	0	0	10	100.6	None
Vanadium	0	0	10	106.0	None
Zinc	0	0	10	100.5	None

For the aluminum and iron results the frequency and magnitude of exceedances were considered to be indicative of a persuasive matrix interference. Therefore, all aluminum and iron results have been qualified as estimated, with the exception of the parent samples with the matrix recoveries within acceptance criteria. The parent sample TSS-14-9-T01N-PLTF was qualified as estimated based on the area exceedance for lead MS data. For selenium, three matrix recoveries were reported outside acceptance criteria, one low, and two high. All associated parent sample results were reported as non-detect, and therefore only parent sample TSS-14-6-T02N-PLTF was qualified based on the potential low bias.

The antimony matrix spike recovery for sample TSS-14-8-T02N-PLTG was reported below 30%. However, at project on-set, it was known that the method of digestion for metals was not effective for antimony. As antimony is not considered to be a site-related contaminant, a separate digestion was not considered to be necessary. As such, the low antimony recoveries

were not unexpected and the antimony data are considered usable in meeting project objectives in spite of the low bias. Therefore, the antimony data for sample TSS-14-8-T02N-PLTG has been qualified as estimated, with a potential low bias.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

The table below illustrates the site-samples that were used to prepare laboratory duplicate samples. As 9 LD were prepared and analyzed for 70 field samples (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Sub Matrix	Data Package	Analyses
TSS14-9-T01N-PLTF	Plants		BIO037	Total Metals
TSS14-7-T01N-PLTS	Plants		BIO037	Total Metals
TSS14-8-T01N-PLTG	Plants		BIO037	Total Metals
TSS14-8-T02N-PLTG	Plants		BIO037	Total Metals
TSS14-6-T01N-PLTF	Plants		BIO038	Total Metals
TSS14-6-T02N-PLTF	Plants		BIO038	Total Metals
CR-6-T01N-PLTS	Plants		BIO039	Total Metals
CR-6-T02N-PLTS	Plants		BIO039	Total Metals
RRBV-1-T01N-PLTS	Plants		BIO041	Total Metals
RS-13A-T01N-PLTF	Plants		BIO047	Total Metals

With three exceptions, the relative percent differences (RPDs) or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within QAPP acceptance limits. The exceptions and the resultant data qualifiers are summarized in the table below.

Analyte	Sample ID	Criterion	Action
Iron	TSS14-6-T02N-PLTF and RS-13A-T01N-PLTF	>50%	J D-I Parent Sample Only
% Solid	TSS14-6-T02N-PLTF	>50%	J D-I Parent Sample Only
Manganese	RS-13A-T01N-PLTF	>50%	J D-I Parent Sample Only

Based on the LD results, the overall level of precision demonstrated is considered to be acceptable. Only the parent samples associated with the iron, manganese, and % solids that did not meet acceptance criteria were qualified.

4.3 SERIAL DILUTION RESULTS

Serial dilution tests involve the analysis of a sample and a five-fold dilution of the same sample. When analyte concentrations are sufficiently high (i.e., greater than 50x the instrument detection limit [IDL]), the original result and diluted sample result are expected to be fairly comparable. If the results are not comparable, it is generally assumed that there are matrix interferences that are resulting in the suppression of elevation of the signal for one or more analyses.

The table below lists the site samples used for serial dilution analyses.

Sample ID	Matrix	Sub Matrix	Data Package	Analyses
TSS14-9-T01N-PLTF	Plants		BIO037	Total Metals
TSS14-7-T01N-PLTS	Plants		BIO037	Total Metals
TSS14-8-T01N-PLTG	Plants		BIO037	Total Metals
TSS14-8-T02N-PLTG	Plants		BIO037	Total Metals
TSS14-6-T01N-PLTF	Plants		BIO038	Total Metals
TSS14-6-T02N-PLTF	Plants		BIO038	Total Metals
CR-6-T01N-PLTS	Plants		BIO039	Total Metals
CR-6-T02N-PLTS	Plants		BIO039	Total Metals
RRBV-1-T01N-PLTS	Plants		BIO041	Total Metals
RTBV-4-T01N-PLTS	Plants		BIO042	Total Metals
TSS14-4-T01N-PLTG	Plants		BIO040	Total Metals
RS-BA-T01N-PLTF	Plants		BIO047	Total Metals

The original and diluted sample results are compared by a percent difference (%D). When %Ds <10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate that the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result.

A number of %Ds between the originals ample results and the result obtained from a sample diluted 1:5 were >10%. In general, qualification was limited to the parent sample if fewer than a quarter of the applicable serial dilution result were outside the acceptance range. Conversely, if more than a quarter of the applicable serial dilution results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average %D, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

The table below summarizes the results for each analyte, the number of high and low exceedances, and the number of serial dilution results that were considered valid (i.e., the sample concentration was greater than 50 times their IDL).

Analyte	Avg. %D	%Ds >10%	Potential Bias		Number of Valid Results	Action
			Low	High		
Aluminum	12.7	3	3	0	8	J/UJ DL – L Parent Samples only; samples TSS14-6-T02N-PLTF, TSS14-4-T01N-PLTG, TSS14-8-T02N-PLTS
Antimony		NA				None
Arsenic		NA				None
Barium	4.7	0	0	0	5	None
Beryllium	5.2	0	0	0	4	None
Boron	6.3	1	1		4	J DL-L Parent Sample (TSS14-8-T02N-PLTG) Only

Analyte	Avg. %D	%Ds >10%	Potential Bias		Number of Valid Results	Action
			Low	High		
Cadmium	7.2	1	1		4	J DL-L Parent Sample (TSS14-8-T02N-PLTG) Only
Calcium	9.9	4	4	0	10	J/UJ DL – L Parent Samples only; samples TSS14-4-T01N-PLTG, TSS14-6-T02N-PLTF, TSS-14-6-T01N-PLTF, and TSS-14-8-T02N-PLTF
Chromium	4.6	4	0	0	4	None
Cobalt	4.9	1	1		4	J DL-L Parent Sample (TSS14-8-T02N-PLTG) Only
Copper	3.4	4	0	0	6	None
Iron	7.0	2	2	0	8	J DL-L Parent Samples (TSS14-8-T02N-PLTG and TSS14-6-T02N-PLTF) Only
Lead	11.2	1	1	0	3	J/UJ DL – L Parent Sample (TSS14-8-T02N-PLTG) Only
Manganese	10.8	4	4	0	9	J/UJ DL – L Parent Samples only; samples TSS14-8-T02N-PLTG, TSS14-6-T02N-PLTF, TSS14-4-T01N-PLTG, TSS14-6-T01N-PLTF
Magnesium	9.9	2	2	0	3	J/UJ DL-L Parent Samples only; samples TSS14-8-T02N-PLTG and CR-6-T02N-PLTS
Molybdenum	10.9	4	4	0	8	J/UJ DL – L Parent Samples only; samples TSS14-8-T02N-PLTG, TSS4-6-T02N-PLTF, TSS14-4-T01N-PLTG, and TSS14-6-T01N-PLTF
Selenium		NA				None
Nickel	5.5	1	1	0	4	J/UJ DL – L Parent Sample (TSS14-8-T02N-PLTG) Only
Potassium	29.9	11	11	0	11	J/UJ DL – L All results
Thallium		NA				None
Silver	7.1	1	1	0	4	J/UJ DL – L Parent Sample (TSS14-8-T02N-PLTG) Only
Sodium		NA				None
Vanadium	4.3	0	0	0	4	None
Zinc	11.8	4	4	0	10	J/UJ DL–L Parent samples only, samples TSS14-8-T02N-PLTG, TSS14-6-T02N-PLTF, TSS14-4-T10N-PLTG, and TSS-14-6-T01N-PLTF

A number of %Ds between the original sample results and the result obtained from a sample diluted 1:5 were >10%. In general, qualification was limited to the parent sample if fewer than a quarter of the applicable serial dilution results were outside the acceptance range. Conversely, if more than a quarter of the applicable serial dilution results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. Evaluation of the serial dilution results for metals where some %D, exceeded 10% indicates that the average %D was either below or close to 20% for most metals. For these metals, the analysis is considered to be in control and there is no indication of a pervasive matrix analytical problem. Therefore, only the result for the associated parent samples were qualified as estimated. Affected metals were aluminum (average %D 12.7%), boron (average %D 6.3%), cadmium (average %D 7.2%), calcium (average %D 9.9%), cobalt (average %D 4.9%), iron (average %D

7%), lead (average %D 11.2%), manganese (average %D 10.8%), magnesium (average %D 9.9%), molybdenum (average %D 10.9%), nickel (average %D 5.5%), silver (average % D 7.1%), and zinc (average %D 11.8%). All potassium %Ds exceeded 10%, with an average %D of 29.9%. These data are considered to be indicative of a pervasive problem relative to potassium, and all potassium sample results were qualified as estimated with a potential low bias to the reported results.

The site-specific blanks (field and rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

5.1 FIELD DUPLICATE RESULTS

Seven field duplicate samples were collected during this sampling event. As there were 70 field samples, the frequency of field duplicate collection satisfied the QAPP requirement of 5%. The field duplicate pairs are listed in the table below.

Sample ID	Matrix	Data Package	Analyses
CR-5-T02N-PLTF/CR-5-T02D-PLTF	Plants	BIO038	Total Metals
CR-7-T01N-PLTF/CR-7-T01D-PLTF	Plants	BIO038	Total Metals
CR-14-T01N-PLTS/CR-14-T01D-PLTS	Plants	BIO039	Total Metals
CR-14-T02N-PLTF/CR-14-T02D-PLTF	Plants	BIO039	Total Metals
TSS14-1-T01N-PLTF/TSS14-1-T01D-PLTF	Plants	BIO041	Total metals
RMBV-2-T01N-PLT/RMBV-2-T01D-PLT	Plants	BIO041	Total Metals
RS-13A-T01N-PLTS/RS-13A-T01D-PLTS	Plants	BIO047	Total Metals

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤50% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL as the reporting limit. For field duplicate pairs where the sample or duplicate concentration was less than five times the reporting limits, the absolute difference between the sample and duplicate was compared to the criterion of ≤ four times the greater RL. With the two exceptions in the table below, the results for all analytes for the five field duplicate pairs satisfied the applicable evaluation criterion.

Analyte	CR-14-T02N-PLTF (mg/kg)	CR-14-T02D-PLTF (mg/kg)	RPD (%)	Action
Iron	445	261	52	J FD-I Parent/Field Duplicate Samples Only
Analyte	**CR-5-T02N-PLT (mg/kg)**	**CR-5-T02D-PLT (mg/kg)**	**RPD (%)**	**Action**
Magnesium	2,140	992	73	J FD-I Parent/Field Duplicate Samples Only

RPD Criteria ≤50%

Based on the FD results, the overall level of precision demonstrated is considered to be acceptable.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. A total of twelve rinsate blank samples were associated with the collection of the RI/FS plant samples, as listed below.

Event	Sample Identification	SDG ID
RIFS Plants - June, Aug, Sept	RB01T-PLTS-053003	WISS02
RIFS Plants - June, Aug, Sept	RB02T-PLTG-052903	WISS01
RIFS Plants - June, Aug, Sept	RB03T-PLTS-053103	WISS02
RIFS Plants - June, Aug, Sept	RB04T-PLTS-053103	WISS02
RIFS Plants - June, Aug, Sept	RB05T-PLTG-060203	WISS02
RIFS Plants - June, Aug, Sept	RB06T-PLTG-060203	WISS02
RIFS Plants - June, Aug, Sept	RB07T-PLTS-060203	WISS02
RIFS Plants - June, Aug, Sept	RB08T-PLTG-060303	WISS03
RIFS Plants - June, Aug, Sept	RB09T-PLTG-060303	WISS03
RIFS Plants - June, Aug, Sept	RB10T-PLTS-060303	WISS03
RIFS Plants - June, Aug, Sept	RB11T-PLTS-060303	WISS03
RIFS Plants - June, Aug, Sept	RB12T-PLTG-060303	WISS03

The RI/FS plant rinsate samples were submitted for analysis with other aqueous samples collected as part of the overall remedial investigation program. The validation of these data is included in the data validation reports for the data packages in which they are reported. As twelve rinsate blanks were prepared and analyzed for 75 field samples, the QAPP frequency for rinsate blank QC samples (5%) was satisfied. The table below summarizes the detected rinsate blank results.

Parameter	Sample Identification	Concentration	RL (ug/L)	Frequency of Detection	Average Concentration (ug/L)	Range of Detected Field Samples (mg/kg)
Calcium	RB06T-PLTG-060203	2240	305	1 of 12	300	929 to 13200
Copper	RB03T-PLTS-053103	10.9	0.9	3 of 12	1.52	0.48 to 41.2
	RB09T-PLTG-060303	2.4				
	RB10T-PLTS-060303	0.92				
Iron	RB02T-PLTG-052903	36.9	33.3 42.2	2 of 12	33.8	11.8 to 14200
	RB06T-PLTG-060203	96				
Lead	RB09T-PLTG-060303	9.1	0.1	2 of 12	0.95	0.074 to 26.8
	RB11T-PLTS-060303	0.4				
Manganese	RB01T-PLTS-053003	0.24	0.2	3 of 12	0.26	2.5 to 499
	RB03T-PLTS-053103	0.24				
	RB04T-PLTS-053103	0.33				
Nickel	RB10T-PLTS-060303	0.61	0.6	2 of 12	0.59	0.17 to 15.5
	RB11T-PLTS-060303	3.5				
Sodium	RB11T-PLTS-060303	579	532	1 of 12	290	17.8 to 536
Zinc	RB11T-PLTS-060303	24.3	1.6	1 of 12	3.37	5.2 to 98.3

1 For non-detects ½ the reporting limit was used in the calculation of the average concentration.

Eight metals (calcium, copper, iron, lead, manganese, nickel, sodium, and zinc) were reported as detected in three or less of the rinsate/blanks. It is considered that low-levels of detected concentrations may be attributable to contamination. Evaluation of the range of detected concentrations for each analyte reported in the rinsates provides an indication of the reasonable maximum likely contribution for each of these analytes. Since the detected concentrations in the rinsate blank samples were low level (relative to sample concentrations) and that three or less detects for any metal were reported in the rinsate blanks, it was considered that these results are not indicative of systematic contamination. No data have been qualified on the basis of the rinsate blank samples associated with the RI/FS plant samples.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank contamination. Some sample results were qualified as estimated on the basis of the MS results. A general overall assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

Approximately 98% of the field duplicate results and 99% of the LD results satisfied the applicable criteria. As such, the overall level of precision demonstrated is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of LCSs and MS.

All of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP. As such, all of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP which is considered to be indicative of acceptable overall accuracy with respect to the analytical system.

Ninety-three percent of the MS spike recoveries satisfied the applicable evaluation criteria for accuracy specified in QAPP which is considered to be indicative of acceptable overall accuracy attained with respect to the site matrix.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

Eighty-two RI/FS plant samples were submitted for metals analysis. All of the metal results for the 82 samples analyzed (75 field samples and 7 field duplicates) are considered usable as qualified for meeting project objective. As such, the completeness for the samples analyzed is 100% which satisfies the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS,

2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the plants. The close agreement between the field duplicate results is considered to indicate that the samples collected are adequately representative of the medium sampled. Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. As noted in Section 6.1, 99% of the LD results satisfied the precision evaluation indicating that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

The sample results and reporting limits have been adjusted accordingly for the weight used for digestion. It is anticipated that all data will be usable in the risk assessment. Although, no screening level criteria for plants were provided in the QAPP or the Baseline Ecological Risk Assessment to which RLs for nondetect analytes could be compared, non-detect sample results were evaluated against the ecological RBSL. The majority of samples for antimony analyses were diluted 10x. For these analyses, all antimony non-detect sample results were reported at values above the ecological RBSL, and the data URS will need to evaluate whether these results support data-use objectives.

Attachments

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: BIO037 Sampling Event: Spring 2003

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 08/28/03

Peer Reviewer: Geoff Webb Date Completed: 10/16/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses
				Metals
EB037	EB	528966	B	X
TSS14-10-T01N-PLTF	SA	528964	B	X
TSS14-10-T02N-PLTF	SA	528965	B	X
TSS14-7-T01N-PLTF	SA	529014	B	X
TSS14-7-T01N-PLTG	SA	529016	B	X
TSS14-7-T01N-PLTS(1)	MS	529018	B	X
TSS14-7-T02N-PLTF	SA	529015	B	X
TSS14-7-T02N-PLTG	SA	529017	B	X
TSS14-7-T02N-PLTS	SA	529019	B	X
TSS14-8-T01N-PLTF	SA	529022	B	X
TSS14-8-T01N-PLTG(1)	MS	529020	B	X
TSS14-8-T01N-PLTS	SA	529024	B	X
TSS14-8-T02N-PLTF	SA	529023	B	X
TSS14-8-T02N-PLTG(1)	MS	529021	B	X
TSS14-8-T02N-PLTS	SA	529025	B	X
TSS14-9-T10N-PLTF(1)	MS	528962	B	X
TSS14-9-T02N-PLTF	SA	528963	B	X

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank EB = Equipment Blank
FB = Field Blank FD = Field Duplicate

(1) Additional sample volume provided and used for matrix QC.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses

were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results, and their qualifications are summarized in Table 1.1. Three target analytes were detected in the equipment blank (EB037) after accounting for method blank contamination. The resultant qualifications from these results are summarized in Table 1.1.
Matrix QC • MS and LD TSS14-7-T01N-PLTS TSS14-8-T01N-PLTG TSS14-8-T02N-PLTS TSS14-9-T01N-PLTF	Yes	Several results for associated matrix QC samples TSS14-8-T01N-PLTG, TSS14-8-T02N-PLTS, and TSS14-9-T01N-PLTF were qualified on the basis of matrix spike results. The results and actions are summarized in Table 1.2a – Table 1.2c. All LD results satisfied the applicable concentration dependent evaluation criterion. The matrix spike and laboratory duplicate results for the RI/FS plant sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Method QC • PDS and Serial Dilution TSS14-7-T01N-PLTS TSS14-8-T01N-PLTG TSS14-8-T02N-PLTG TSS14-9-T01N-PLTF • Internal Standards	No	Several metal results in the serial dilution analysis of TSS14-8-T01N-PLTG, TSS14-8-T02N-PLTS, and TSS14-9-T01N-PLTF were outside of the ± 10% limits in the QAPP. The serial dilution was conducted on the matrix spike sample due to low concentrations in the original sample. These results and assigned qualification are summarized in Table 1.3a – Table 1.3d. With one exception, recoveries for all post-digestion spikes were within the acceptance limits. The PDS recovery for iron for sample TSS14-6-T02N-PLTF was below the acceptance limits of 75-125% with a recovery of 69.5%. The iron matrix spike recovery was not considered appropriate for assessing accuracy because the sample result was greater than four times the spike amount. Data qualification was not issued based on the PDS recovery. The serial dilution results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Field QC • Field Duplicate	No	This package did not include any field QC results. The field QC results for the RI/FS plant sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters: Evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Laboratory Blank Results Outside Evaluation Criteria Resulting in Data Qualification

Analyte	CCB 2,3,5 (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Sample Qualified	Qualification Code
Beryllium	0.6			0.3	TSS14-7-T02N-PLTF TSS14-7-T02N-PLTS TSS14-8-T02N-PLTF TSS14-8-T02N-PLTS TSS14-9-T02N-PLTF	U CCB-I
Cadmium		0.06		0.5	TSS14-10-T01N-PLTF TSS14-10-T02N-PLTF TSS14-7-T01N-PLTS TSS14-7-T02N-PLTG TSS14-8-T01N-PLTG TSS14-8-T01N-PLTS TSS14-8-T02N-PLTF TSS14-9-T01N-PLTF TSS14-9-T02N-PLTF	U MB-I
Calcium		36.660		308.5	EB037	U MB-I
Sodium			38.1		TSS14-10-T01N-PLTF TSS14-7-T01N-PLTF TSS14-8-T01N-PLTF TSS14-8-T01N-PLTS TSS14-8-T02N-PLTF TSS14-9-T02N-PLTF	U EB-I

CCB – Continuing Calibration Blank **MB –** Method of Preparation Blank
IDL – Instrument Detection Limit for Metals **EB –** Equipment Blank

Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2a
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualifications for Sample TSS14-8-T01N-PLTG

Analyte	MS%R	Comment	Action
Aluminum	131.7	Parent sample result qualified.	J MS-H
Iron	131.1	Parent sample result qualified	J MS-H

Evaluation criteria:
Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.2b
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualifications for Sample TSS14-8-T02N-PLTS

Analyte	MS%R	Comment	Action
Antimony	25.7	Parent sample nondetect result estimated	J MS-L

Evaluation criteria:
Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.2c
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualifications for Sample TSS14-9-T01N-PLTF

Analyte	MS%R	Comment	Action
Aluminum	131.8	Parent sample result qualified.	J MS-H
Iron	138.8	Parent sample result qualified	J MS-H
Lead	137.3	Parent sample result qualified	J MS-H

Evaluation criteria:
Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.3a
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample TSS14-7-T01N-PLTS

Analyte	| % D |	Action
Potassium	38.4	J DL-L

QC limits ± 10 %

Table 1.3b
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample TSS14-8-T01N-PLTG

Analyte	| % D |	Action
Potassium	34	J DL-L

QC limits ± 10 %

Table 1.3c
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample TSS14-8-T02N-PLTG

Analyte	| % D |	Action
Aluminum	12.7	J DL-L
Boron	12.7	
Cadmium	16.3	
Calcium	12.4	
Cobalt	11.3	
Iron	11	
Lead	23.7	
Magnesium	12.9	
Manganese	11.8	
Molybdenum	10.5	
Nickel	13	
Potassium	35.9	
Silver	13.9	
Zinc	15.6	

QC limits ± 10 %

Table 1.3d
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample TSS14-9-T01N-PLTF

Analyte	| % D |	Action
Potassium	39.2	J DL-L

QC limits ± 10 %

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: BIO038 Sampling Event: Spring 2003

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 09/21/03

Peer Reviewer: Geoff Webb Date Completed: 10/16/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses
				Metals
CR-10-T01N-PLTF	SA	529244	B	X
CR-10-T02N-PLTF	SA	529245	B	X
CR-5-T01N-PLTS	SA	529026	B	X
CR-5-T02D-PLTS	FD	529028	B	X
CR-5-T02N-PLTS	SA	529027	B	X
CR-7-T01D-PLTS	FD	529032	B	X
CR-7-T01N-PLTF	SA	529034	B	X
CR-7-T01N-PLTS	SA	529031	B	X
CR-7-T02N-PLTF	SA	529035	B	X
CR-7-T02N-PLTS	SA	529033	B	X
CR-8-T01N-PLTF	SA	529029	B	X
CR-8-T02N-PLTF	SA	529030	B	X
EB038	EB	529036	B	X
TSS14-6-T01N-PLTF[(1)]	MS	529242	B	X
TSS14-6-T02N-PLTF[(1)]	MS	529243	B	X

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank EB = Equipment Blank
FB = Field Blank FD = Field Duplicate

[(1)] Additional sample volume provided and used for matrix QC.

Case Narrative Summary: With two exceptions, all issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses

were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Percent solid not performed on Sample CR-10-T02N-PLTF because all of the sample volume was used for metals analysis.

The RPD between the %solid for sample TSS14-6-T02N-PLT exceeded the evaluation criterion of ≤50% with an RPD of 58%. Therefore, the %solid result for sample TSS14-6-T02N-PLTF was qualified as estimated (J) with an indeterminate bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results and their qualifications are summarized in Table 1.1. No target analytes were detected in the equipment blank (EB038).
Matrix QC • MS and LD TSS14-6-T01N-PLTF TSS14-6-T02N-PLTF	No	Several results for samples TSS14-6-T01N-PLTF and TSS14-6-T02N-PLTF were qualified on the basis of matrix spike results. The results and actions are summarized in Table 1.2a and Table 1.2b. With one exception for TSS14-6-T01N-PLTF, all LD results satisfied the applicable concentration dependent evaluation criterion. The result and action are summarized in Table 1.2b. The matrix spike and laboratory duplicate results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Method QC • PDS and Serial Dilution TSS14-6-T01N-PLTF TSS14-6-T02N-PLTF • Internal Standards	No	Several metal results in the serial dilution analysis were outside of the ± 10% limits in the QAPP. The results and assigned qualification are summarized in Tables 1.3a and 1.3b. The serial dilution results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Field QC • Field Duplicate CR-5-T02N-PLT/CR-5-T02D-PLT CR-7-T01N-PLTF/CR-7-T01D-PLTF • Other (e.g., splits)	No	One analyte for the field duplicate pair CR-5-T02N-PLT/CR-5-T02D-PLT was outside the applicable concentration dependent criterion expressed in the QAPP. The results are summarized in Table 1.4. The field QC results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Nondetect Results w/ Elevated RLs?	No	All samples for antimony analysis were diluted 10x and results were reported as non-detect at an elevated RL.
Package Completeness	Yes	
Other parameters Evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Laboratory Blank Results Outside Evaluation Criteria Resulting in Data Qualification

Analyte	CCB (µg/l)	MB (mg/Kg)	IDL (µg/L)	Sample Qualified	Qualification Code
Chromium		0.151	1.0	TSS14-6-T01N-PLTF CR-5-T01N-PLTS CR-7-T01N-PLTF	U MB-I
Nickel		-0.310	3.0	TSS14-6-T01N-PLTF TSS14-6-T02N-PLTF CR-10-T01N-PLTF CR-7-T01D-PLTS CR-7-T01N-PLTF CR-7-T01N-PLTS CR-7-T02N-PLTS CR-8-T01N-PLTF CR-8-T02N-PLTF	J MB-I (Detects) UJ MB-I (Nondetects)
Beryllium	0.45		0.3	CR-10-T01N-PLTF CR-10-T02N-PLTF CR-5-T02D-PLTS CR-7-T02N-PLTF CR-7-T02N-PLTS CR-8-T01N-PLTF CR-8-T02N-PLTF CR-5-T02N-PLTS	U CCB-I

CCB – Continuing Calibration Blank **MB** – Method of Preparation Blank **IDL** – Instrument Detection Limit for Metals
Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2a
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualification for Sample TSS14-6-T01N-PLTF

Analyte	MS%R	Comment	Action
Aluminum	149.7	Parent sample result qualified.	J MS-H
Iron	172.6	Parent sample result qualified	J MS-H

Evaluation criteria:
Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.2b
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualification for Sample TSS14-6-T02N-PLTF

Analyte	LD (RPD)	MS%R	Comment	Action
Aluminum		228.3	Parent sample result qualified.	J MS-H
Molybdenum		63	Parent sample result qualified.	J MS-L
Iron	69.5		Parent sample result qualified	J D-I

Evaluation criteria:
Matrix Spike % Recovery Limit 75 – 125 % for metals
LD RPD limit ≤50%

Table 1.3a
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample TSS14-6-T01N-PLTF

Analyte	| % D |	Action
Calcium	29.1	J DL-L
Manganese	27.1	
Potassium	46.8	
Zinc	29.2	
Molybdenum	26.5	

QC limits ± 10 %

Table 1.3b
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample TSS14-6-T02N-PLTF

Analyte	| % D |	Action
Aluminum	21.5	J DL-L
Calcium	21.8	
Iron	21.6	
Manganese	19.9	
Molybdenum	18.7	
Zinc	23.6	

QC limits ± 10 %

Table 1.4
Field Duplicate Pair Results Outside Evaluation Criteria Resulting in Data Qualification for CR-5-T02N-PLT/CR-5-T02D-PLT

Analyte	CR-5-T02N-PLT (mg/kg)	CR-5-T02D-PLT (mg/kg)	RPD (%)	Action
Iron	2140	992	73	J FD-I

RPD Criteria ≤50% EQL – Estimation Quantitation Limit

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: BIO039 Sampling Event: Spring 2003

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 09/21/03

Peer Reviewer: Geoff Webb Date Completed: 10/16/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses
				Metals
CR-13-T01N-PLTF	SA	530014	B	X
CR-13-T02N-PLTF	SA	530015	B	X
CR-14-T01D-PLTS	FD	530017	B	X
CR-14-T01N-PLTF	SA	530021	B	X
CR-14-T01N-PLTG	SA	530019	B	X
CR-14-T1N-PLTS	SA	530016	B	X
CR-14-T02D-PLTF	FD	530023	B	X
CR-14-T02N-PLTF	SA	530022	B	X
CR-14-T02N-PLTG	SA	530020	B	X
CR-14-T02N-PLTS	SA	530018	B	X
CR-6-T01N-PLTG	SA	530012	B	X
CR-6-T01N-PLTS[(1)]	MS	530010	B	X
CR-6-T02N-PLTG	SA	530013	B	X
CR-6-T02N-PLTS[(1)]	MS	530011	B	X
EB039	EB	530024	B	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank EB = Equipment Blank FB = Field Blank FD = Field Duplicate

[(1)] Additional sample volume provided and used for matrix QC.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses

were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Samples CR-13-T01N-PLTF and CR-13-T02N-PLTF were logged in according to the sample labels not the COC (CR-6-T01N-PLTF and CR-6-T02N-PLTF). TKN was requested on the COC. Subsequently, URS cancelled the TKN analysis as TKN is not a required parameter for the RI/FS plant samples.
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Several target analytes were detected in the method and continuing calibration blanks. The affected samples, results and their qualifications from these results are summarized in Tables 1.1. After accounting for method blank contamination, two target analytes (potassium and zinc) were detected in the equipment blank (EB039). Data qualification was not considered necessary because all potassium and zinc results were reported at concentrations greater than five times the amount found in the method blank.
Matrix QC • MS and LD CR-6-T01N-PLTS CR-6-T02N-PLTS	No	Several results for samples CR-6-T01N-PLTS and CR-6-T02N-PLTS were qualified on the basis of matrix spike results. The results and actions are summarized in Table 1.2a and Table 1.2b. All LD results satisfied the applicable concentration dependent evaluation criterion. The matrix spike and laboratory duplicate results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Method QC • PDS and Serial Dilution CR-6-T01N-PLTS CR-6-T02N-PLTS • Internal Standards	No	Several metal results in the serial dilution analysis were outside of the ± 10% limits in the QAPP. The results and assigned qualification are summarized in Tables 1.3a and 1.3b. The serial dilution results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Field QC • Field Duplicate CR-14-T01N-PLTS/CR-14-T01D-PLTS CR-14-T02N-PLTF/CR-14-T02D-PLTF	No	One analyte for the field duplicate pair CR-14-T02N-PLTF/CR-14-T02D-PLTF was outside the applicable concentration dependent criterion expressed in the QAPP. The results are summarized in Table 1.4. The field QC results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Nondetect Results w/ Elevated RLs?	No	All samples for antimony analysis were diluted 10x, and results were reported as non-detect at an elevated RL.
Package Completeness	Yes	
Other parameters Evaluated based on case narrative comments or review of laboratory performance parameters.	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum results of 156% and 187% and iron results of 140% and 157%. Associated aluminum and iron sample results may potentially be biased high for values reported close to the aluminum and iron CRDL concentrations of 40 mg/kg and 20 mg/kg, respectively. Sample data have not been qualified on the basis of CRDL standards. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Laboratory Blank Results Outside Evaluation Criteria Resulting in Data Qualification

Analyte	CCB (µg/l)	MB (mg/Kg)	IDL (µg/L)	Sample Qualified	Qualification Code
Chromium		0.290	0.6	CR-13-T01N-PLTF CR-14-T01D-PLTS CR-14-T01N-PLTF CR-14-T01N-PLTG CR-14-T01N-PLTS CR-14-T02D-PLTF CR-14-T02N-PLTF CR-6-T01N-PLTG CR-6-T01N-PLTS CR-6-T02N-PLTS EB036	U MB-I
Copper	-1.4		1.4	CR-13-T01N-PLTF CR-14-T01D-PLTS CR-14-T01N-PLTF CR-14-T01N-PLTS CR-14-T02D-PLTF CR-14-T02N-PLTF EB036	J CCB-L
Silver	0.9		0.9	CR-14-T01N-PLTF |CR-14-T02D-PLTF CR-14-T02N-PLTF CR-14-T02N-PLTG	U CCB-I
Sodium	-334.9		218.8	CR-14-T01N-PLTF CR-14-T02D-PLTF CR-14-T02N-PLTF EB036	J CCB-L
Boron		0.524	4.6	CR-6-T01N-PLTG	U MB-I
Aluminum	83.3	2.647	18.3	EB036	U MB,CCB-I

CCB – Continuing Calibration Blank **MB** – Method of Preparation Blank **IDL** – Instrument Detection Limit for Metals

Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2a
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualifications for Sample CR-6-T01N-PLTS

Analyte	MS%R	Comment	Action
Aluminum	149.8	Parent sample result qualified.	J MS-H
Iron	150.7	Parent sample result qualified	J MS-H
Selenium	194.9	Parent sample result qualified	J MS-H

Evaluation criteria:

Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.2b
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualifications for Sample CR-6-T02N-PLTS

Analyte	MS%R	Comment	Action
Aluminum	306.8	Parent sample result qualified.	J MS-H
Selenium	138.5	Parent sample result qualified.	J MS-H

Evaluation criteria:

Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.3a
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample CR-6-T01N-PLTS

Analyte	| % D |	Action
Potassium	24.9	J DL-L

QC limits ± 10 %

Table 1.3b
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample CR-6-T02N-PLTS

Analyte	| % D |	Action
Potassium	24.9	J DL-L
Magnesium	11.4	

QC limits ± 10 %

Table 1.4
Field Duplicate Pair Results Outside Evaluation Criteria Resulting in Data Qualification for CR-14-T02N-PLTF/CR-14-T02D-PLTF

Analyte	CR-14-T02N-PLTF (mg/kg)	CR-14-T02D-PLTF (mg/kg)	RPD (%)	Action
Iron	445	261	52	J FD-I

RPD Criteria ≤50%

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: BIO049 Sampling Event: Spring 2003

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 09/21/03

Peer Reviewer: Geoff Webb Date Completed: 10/16/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses
				Metals
CR-2-T01N-PLTS	SA	530077	B	X
CR-2-T02N-PLTS	SA	530078	B	X
TSS14-1-T01D-PLTF	FD	530082	B	X
TSS14-1-T01N-PLTF	SA	530081	B	X
TSS14-1-T01N-PLTS	SA	530079	B	X
TSS14-1-T02N-PLTF	SA	530083	B	X
TSS14-1-T02N-PLTS	SA	530080	B	X
TSS14-2-T01N-PLTF	SA	530075	B	X
TSS14-2-T02N-PLTF	SA	530076	B	X
TSS14-3-T01N-PLTF	SA	530089	B	X
TSS14-3-T02N-PLTF	SA	530090	B	X
TSS14-4-T01N-PLTF	SA	530087	B	X
TSS14-4-T01N-PLTG	SA	530085	B	X
TSS14-4-T02N-PLTF	SA	530088	B	X
TSS14-4-T02N-PLTG	SA	530086	B	X
TSS14-5-T01N-PLTF	SA	530091	B	X
TSS14-5-T02N-PLTF	SA	530092	B	X

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank EB = Equipment Blank FB = Field Blank
FD = Field Duplicate

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses

were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target affected samples, results, and their analytes were detected in the method and continuing calibration blanks. The affected samples, results, and their qualifications are summarized in Table 1.1. An equipment blank was generated at the time of tissue preparation/homogenization. However, due to a mishap in the laboratory all of the volume generated was lost before it could be analyzed. Therefore, no results are available for this blank. This is not considered to affect the usability of the data because no results were qualified based on the equipment blank from the other six data packages associated with the RI/FS plant sampling event.
Matrix QC • MS and LD • None	NA	This package did not include any matrix QC results. The matrix spike and laboratory duplicate results for the RI/FS plant sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Method QC • PDS • None • Serial Dilution TSS14-4-T01N-PLTG • Internal Standards	No	Several metal results in the serial dilution analysis were outside of the ± 10% limits in the QAPP. The results and assigned qualification are summarized in Table 1.3. The serial dilution results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Field QC • Field Duplicate TSS14-1-T01N-PLTF/ TSS14-1-T01D-PLTF	Yes	All field QC data were within evaluation criteria. The field QC results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Nondetect Results w/ Elevated RLs?	No	All sample results for antimony analysis were diluted 10x and results were reported as non-detect at an elevated RL.
Package Completeness	Yes	
Other parameters Evaluated based on case narrative comments or review of laboratory performance parameters.	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum results of 243% and 212% and iron results of 214% and 187%. Associated aluminum and iron sample results may potentially be biased high for values reported close to the aluminum and iron CRDL concentrations of 40 mg/kg and 20 mg/kg, respectively. Sample data have not been qualified on the basis of CRDL standards. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Laboratory Blank Results Outside Evaluation Criteria Resulting in Data Qualification

Analyte	CCB (µg/l)	MB (mg/Kg)	IDL (µg/L)	Sample Qualified	Qualification Code
Beryllium	-0.002 -0.003 -0.005	0.023		With the exception of the beryllium result for sample TSS14-4-T02N-PLTG, all beryllium results.	UJ CCB-L (nondetects) UJ MB, CCB-L (detectable results)
Chromium		0.157		CR-2-T01N-PLTS TSS14-1-T01N-PLTF TSS14-5-T01N-PLTF	U MB-I
Sodium	994.8			TSS14-1-T01D-PLTF TSS14-1-T01N-PLTF TSS14-1-T01N-PLTS TSS14-1-T02N-PLTF TSS14-1-T02N-PLTS	U CCB-I

CCB – Continuing Calibration Blank**MB** – Method of Preparation Blank**IDL** – Instrument Detection Limit for Metals

Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample TSS14-4-T01N-PLTG

Analyte	| % D |	Action
Aluminum	46.5	J DL-L
Calcium	12	
Manganese	11.2	
Molybdenum	17.2	
Potassium	38.6	
Zinc	21.9	

QC limits ± 10 %

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: BIO041 Sampling Event: Spring 2003

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 09/21/03

Peer Reviewer: Geoff Webb Date Completed: 1016/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses
				Metals
CR-11-T01N-PLTF	SA	530422	B	X
CR-12-T02N-PLTF	SA	530423	B	X
EB041	EB	530424	B	X
RTBV-1-T01N-PLT	SA	530650	B	X
RMBV-2-T01D-PLT[2]	FD	530652	B	X
RMBV-2-T01N-PLT[2]	SA	530651	B	X
RMBV-3-T01N-PLT[2]	SA	530653	B	X
RRBV-1-T01N-PLT[1,2]	MS	530647	B	X
RRBV-2-T01N-PLT[2]	SA	530648	B	X
RRBV-3-T01N-PLT[2]	SA	530649	B	X
RTBV-1-T01N-PLT[2]	SA	530644	B	X
RTBV-2-T01N-PLT[2]	SA	530645	B	X
RTBV-3-T01N-PLT[2]	SA	530646	B	X

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank EB = Equipment Blank
FB = Field Blank FD = Field Duplicate

[1] Additional sample volume provided and used for matrix QC.
[2] Samples are

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blank • Equipment Blank	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results, and their qualifications from these results are summarized in Table 1.1. After accounting for method blank contamination, only potassium was detected in the equipment blank (EB041) at a concentration of 26.5 mg/kg. Data qualification was not considered necessary because all potassium results were reported at concentrations greater than five times the amount found in the equipment blank.
Matrix QC • MS and LD RRBV-1-T01N-PLT	Yes	All matrix QC data were within evaluation criteria. The matrix spike and laboratory duplicate results for the RI/FS plant sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Method QC • PDS and Serial Dilution RRBV-1-T01N-PLT • Internal Standards	No	One metal result in the serial dilution analysis was outside of the ± 10% limits in the QAPP. The results and assigned qualification are summarized in Table 1.2. All PDS recoveries were within the acceptance limits of 75-125%. The serial dilution results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Field QC • Field Duplicate RMBV-2-T01N-PLT/RMBV-2-T01D-PLT	Yes	All field QC data were within evaluation criteria. The field QC results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Nondetect Results w/ Elevated RLs?	No	All samples for antimony analysis were diluted 10x and results were reported as non-detect at an elevated RL.
Package Completeness	Yes	
Other parameters: Evaluated based on case narrative comments or review of laboratory performance parameters.	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum results of 158% and 170%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum CRDL concentrations of 40 mg/kg. Sample data have not been qualified on the basis of CRDL standards. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Laboratory Blank Results Outside Evaluation Criteria Resulting in Data Qualification

Analyte	CCB	MB	IDL	Sample Qualified	Qualification

	(µg/L)	(mg/kg)	(µg/L)		Code
Beryllium		-0.024	0.2	All beryllium results qualified.	UJ MB-L
Lead		0.158	1.5	CR-11-T01N-PLTF EB041 RMBV-2-T01D-PLT RMBV-2-T01N-PLT RRBV-1-T01N-PLT RRBV-2-T01N-PLT RRBV-3-T01N-PLT RTBV-1-T01N-PLT RTBV-2-T01N-PLT RTBV-3-T01N-PLT	U MB-I
Nickel		-0.301	2.0	With the exception of the nickel result for sample CR-11-T02N-PLTF, all nickel results were qualified.	UJ/J MB-L
Silver		-0.110	0.9	All silver results qualified.	UJ MB-L
Sodium	292.9	47.940	218.8	CR-11-T01N-PLTF CR-11-T02N-PLTF EB041 RRBV-1-T01N-PLT RRBV-3-T01N-PLT RTBV-1-T01N-PLT RTBV-2-T01N-PLT RTBV-3-T01N-PLT	U MB-I Or U MB, CCB-I
Aluminum	49.2 46.7 36.8	4.508	18.3	EB041 RMBV-1-T01N-PLT RMBV-2-T01D-PLT RMBV-2-T01N-PLT RRBV-1-T01N-PLT RRBV-2-T01N-PLT RRBV-3-T01N-PLT RTBV-1-T01N-PLT RTBV-2-T01N-PLT RTBV-3-T01N-PLT	U MB,CCB-I
Chromium		0.091	0.10	RMBV-1-T01N-PLT RMBV-2-T01D-PLT RMBV-2-T01N-PLT RRBV-1-T01N-PLT RMBV-3-T01N-PLT RRBV-2-T01N-PLT RRBV-3-T01N-PLT RTBV-3-T01N-PLT	U MB-I
Boron	7.4 7.2 5.2	0.817	4.6	EB041	U MB, CCB-I
Molybdenum	2.4		1.6	RRBV-1-T01N-PLT RRBV-2-T01N-PLT RTBV-1-T01N-PLT RTBV-2-T10N-PLT RTBV-3-T01N-PLT	U CCB-I

CCB – Continuing Calibration Blank **MB** – Method of Preparation Blank **IDL** – Instrument Detection Limit for Metals

Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample RRBV-1-T01N-PLT

Analyte	| % D |	Action
Potassium	21.1	J DL-L

QC limits ± 10 %

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: BIO042 Sampling Event: Spring 2003

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 09/21/03

Peer Reviewer: Geoff Webb Date Completed: 10/16/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses
				Metals
EB042	EB	532948	B	X
RTBV-4-T01N-PLT	SA	532946	B	X
RTBV-5-T01N-PLT	SA	532947	B	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank EB = Equipment Blank
FB = Field Blank FD = Field Duplicate

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The cooler temperature upon arrival at the laboratory was 1°c slightly below the recommended acceptance range of 4°C±2°C. Data qualification was not considered necessary because the samples were not received frozen.
Holding Times	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results, and their qualifications from these results are summarized in Table 1.1. After accounting for method blank contamination, no target analytes were detected in the equipment blank (EB042).
Matrix QC • MS and LD • None	NA	This package did not contain any matrix QC results. The matrix spike and laboratory duplicate results for the RI/FS plant sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Method QC • PDS and Serial Dilution RTBV-4-T01N-PLT • Internal Standards	No	One metal result in the serial dilution analysis was outside of the ± 10% limits in the QAPP. The results and assigned qualification are summarized in Table 1.2. All PDS recoveries were within the acceptance limits of 75-125%. The serial dilution results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Field QC • Field Duplicate	NA	This package did not contain any field QC results. The field QC results for the RI/FS plant sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Nondetect Results w/ Elevated RLs?	No	Sample RTBV-4-T01N-PLT was analyzed at a 10 x dilution and sample RTBV-5-T01N-PLTwas analyzed at a 2x dilution for antimony, arsenic, chromium, selenium, and thallium. The antimony result for sample RTBV-4-T01N-PLT was requested as non-detect at an elevated RL.
Package Completeness	Yes	
Other parameters: Evaluated based on case narrative comments or review of laboratory performance parameters.	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the iron results of 168% and 187%. Associated iron sample results may potentially be biased high for values reported close to the iron CRDL concentrations of 20 mg/kg. Sample data have not been qualified on the basis of CRDL standards. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Laboratory Blank Results Outside Evaluation Criteria Resulting in Data Qualification

Analyte	MB (mg/Kg)	IDL (µg/L)	Sample Qualified	Qualification Code
Iron	9.574	16.8	RTBV-4-T01N-PLT RTBV-5-T01N-PLT	U MB-I
Manganese	0.168	0.7	EB042	U MB-I
Molybdenum	0.244	1.7	RTBV-5-T01N-PLT	U MB-I

CCB – Continuing Calibration Blank **MB** – Method of Preparation Blank **IDL** – Instrument Detection Limit for Metals

Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2

Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample RTBV-4-T01N-PLT

Analyte	| % D |	Action
Potassium	10.8	J DL-L

QC limits ± 10 %

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: BIO047 Sampling Event: Spring 2003

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 11/05/03

Peer Reviewer: Geoff Webb Date Completed: 11/13/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses
				Metals
EBLK047	EB	541730	B	X
RS-13A-T01D-PLTS	FD	541724	B	X
RS-13A-T01N-PLTF[1]	MS	541725	B	X
RS-13A-T01N-PLTG	SA	541726	B	X
RS-13A-T01N-PLTS	SA	541723	B	X
RS-13A-T02N-PLTF	SA	541728	B	X
RS-13A-T02N-PLTG	SA	541729	B	X
RS-13A-T02N-PLTS	SA	541727	B	X

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank EB = Equipment Blank
FB = Field Blank FD = Field Duplicate

[1] Additional sample volume provided and used for matrix QC.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results and their qualifications from these results are summarized in Table 1.1. After accounting for method blank contamination, only copper was detected in the equipment blank (EB047) at a concentration of 0.96 mg/kg and copper at a concentration of 0.36 mg/kg. The qualifications for copper are summarized in Table 1.1.
Matrix QC MS and LD RS-13A-T01N-PLTF	No	All matrix QC data were within evaluation criteria. With one exception, all LD results satisfied the applicable concentration dependent evaluation criterion. The result and action are summarized in Table 1.2. The matrix spike and laboratory duplicate results for the RI/FS plant sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Method QC • PDS and Serial Dilution RS-13A-T01N-PLTF • Internal Standards	No	One metal result in the serial dilution analysis was outside of the ± 10% limits in the QAPP. The results and assigned qualification are summarized in Table 1.3. All PDS recoveries were within the acceptance limits of 75-125%. The serial dilution results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Field QC • Field Duplicate RS-13A-T01N-PLTS/RS-13A-T01D-PLTS	Yes	All field QC data were within evaluation criteria. The field QC results for the RI/FS plant sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for RI/FS plant samples.
Nondetect Results w/ Elevated RLs?	No	All samples for antimony analysis were diluted 10x and results were reported as non-detect at an elevated RL.
Package Completeness	Yes	
	Yes	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Laboratory Blank Results Outside Evaluation Criteria Resulting in Data Qualification

Analyte	CCB (µg/L)	MB (mg/kg)	EB (mg/kg)	IDL (µg/L)	Sample Qualified	Qualification Code
Iron		2.840		27.8	EBLK047	U MB-I
Copper			0.36	2.2	RS-13A-T01N-PLTG	U EB-I
Chromium		0.165		1.1	EBLK047 RS-13A-T01N-PLTF RS-13A-T01N-PLTG	U MB-I
Sodium	465.5			453.8	RS-13A-T02N-PLTG RS-13A-T02N-PLTS	U CCB-I

CCB – Continuing Calibration Blank **MB –** Method of Preparation Blan
IDL – Instrument Detection Limit for Metals **EB –** Equipment Blank
Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2
Metals Matrix Results Outside Evaluation Criteria Resulting in Data Qualification for Sample RS-13A-T01N-PLTF

Analyte	LD (RPD)	Comment	Action
Iron	67.4	Parent sample result qualified	J D-I
Manganese	67.2	Parent sample result qualified	J D-I

Evaluation criteria:
LD RPD limit ≤50%

Table 1.3
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample RS-13A-T01N-PLTF

Analyte	| % D |	Action
Potassium	14.5	J DL-L

QC limits ± 10 %

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE CHOKECHERRY SAMPLES COLLECTED DURING THE AUGUST 2003 SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004

URS

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Narratives 3-1

Section 4 Collective Summary/Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-2
4.3 Serial Dilution Results 4-2

Section 5 Collective Summary/Assessment of Field QC Results 5-1

5.1 Field Duplicate Results 5-1

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-1
6.4 Representativeness 6-1
6.5 Comparability 6-2
6.6 Sensitivity 6-2

List of Tables

Table 1.1 Field Sample IDs and Associated Data Package Numbers

List of Attachments

Attachment 1.1 Data Review Summary for Data Package BIO045

Attachment 1.2 Data Review Summary for Data package BIO046

This report contains the results of the data validation conducted for 9 chokecherry tissue samples (9 berry samples and 9 juice samples) and associated quality control (QC) samples collected in August of 2003. The chokecherry samples were prepared and analyzed per the provisions outlined in the memo prepared by URS dated August 8, 2003.

The chokecherry samples were reported in two STL Burlington data packages (BIO045 and BIO046). All samples were analyzed for total metals as defined in the RI/FS QAPP. This data validation report describes the data validation process used and presents the data review results for the plant samples and associated QC samples submitted to STL Burlington for chemical analysis. The field sample IDs and associated data package numbers are provided in Table 1-1.

Table 1-1
Field Sample IDs and Associated Data Package Numbers

Data Package	Field ID Recorded on COC	QC Designation
BIO045	EB045B	EB
	EB045J	EB
	RMCC-1-T01N-PLTB	
	RMCC-1-T01N-PLTJ	
	RMCC-2-T01N-PLTB	
	RMCC-2-T01N-PLTJ	
	RMCC-3-T01N-PLTB	
	RMCC-3-T01N-PLTJ	
	RRCC-1-T01N-PLTJ	
	RRCC-1-T01N-PLTB	
	RTCC-1-T01D-PLTB	FD to RTCC-1-T01N-PLTB
	RTCC-1-T01D-PLTJ	FD to RRCC-1-T01N-PLTJ
	RTCC-1-T01N-PLTB	
	RTCC-1-T01N-PLTJ	
	RTCC-2-T01N-PLTB	MS/LD/PDS/LD
	RTCC-2-T01N-PLTJ	MS/LD/PDS/LD
	RTCC-3-T01N-PLTB	
	RTCC-3-T01N-PLTJ	
BIO046	EB046B	EB
	EB046J	EB
	RRCC-2-T01N-PLTB	SD
	RRCC-2-T01N-PLTJ	
	RRCC-4-T01N-PLTB	
	RRCC-4-T01N-PLTJ	

FD = Field Duplicate MS = Matrix Spike LD = Laboratory Duplicate
SD = Serial Dilution PDS = Post-Digestion Spike EB = Equipment Blank

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate or spike duplicate analysis, post-digestion spike recoveries, ICP serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, rinsate blanks, field blanks, and trip blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1 and is as follows: if no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used; if no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used; if no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

In all cases of professional judgment exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative. Section 3 provides the data review narratives for each of the data packages.

The site-specific matrix spike/matrix spike duplicate (MS/MSD) results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of

that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (MS/MSD results, laboratory duplicate results, and serial dilution results) and associated sample qualification. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries which are included in Attachment 1. The data qualifiers, reason codes, and bias codes have been marked on the data sheets, and also stored in the electronic database.

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL Burlington data package BIO045 was used to evaluate laboratory performance criteria. If any problems were noted during review of the STL Burlington laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0.

The site-specific MS results, Laboratory Duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analyses, LD analyses, and the serial dilution results with the samples collected during the sampling event.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

The table below illustrates the site-samples that were used to prepare matrix spike samples. As 2 MS sets, one per submatrix, were prepared and analyzed for 9 chokecherry tissue samples (9 berry samples and 9 juice samples) (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Submatrix	Data Package	Analyses
RTCC-2-T01N-PLTB	Chokecherry	Berry	BIO045	Total Metals
RTCC-2-T01N-PLTJ	Chokecherry	Juice	BIO045	Total Metals

One of 42 spike recoveries, iron for sample RTCC-2-T01N-PLTJ associated with the juice samples, (approximately 2%) was outside of the laboratory historical QC acceptance limits. For the sample results that were greater than four times the spike amount, the MS results were not appropriate for assessing accuracy and precision. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

Post-digestion spikes were conducted for all analytes to aid in determining whether the matrix spike results that were out of acceptance limits were caused by the sample matrix, a bias in the analytical system, or a combination of both. Recoveries for all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

The table below summarizes the results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Analyte	Number of Valid Spike Results	%R <75%	%R >125%	Average MS %R	Action
Aluminum	2	0	0	118.3	None
Antimony	2	0	0	116.0	None
Arsenic	2	0	0	96.8	None
Barium	2	0	0	113.0	None
Beryllium	2	0	0	114.0	None
Boron	2	0	0	110.0	None
Cadmium	2	0	0	112.9	None
Chromium	2	0	0	109.7	None
Copper	2	0	0	117.5	None

Analyte	Number of Valid Spike Results	%R <75%	%R >125%	Average MS %R	Action
Iron	2	0	1	112.6	J MS-H All chokecherry juice detected iron results
Lead	2	0	0	105.7	None
Manganese	2	0	0	114.2	None
Mercury	2	0	0	110.7	None
Molybdenum	2	0	0	112.8	None
Selenium	2	0	0	80.8	None
Nickel	2	0	0	110.1	None
Thallium	2	0	0	109.8	None
Silver	2	0	0	101.8	None
Vanadium	2	0	0	115.5	None
Zinc	2	0	0	108.2	None

With the exception of iron results associated with the chokecherry juice samples, all the matrix spike recoveries demonstrated that acceptable overall accuracy was attained with respect to the site matrix.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

The table below illustrates the site-samples that were used to prepare laboratory duplicate samples. As 2 LD were prepared and analyzed for 9 chokecherry tissue samples (9 berry samples and 9 juice samples) (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Submatrix	Data Package	Analyses
RTCC-2-T01N-PLTB	Chokecherry	Berry	BIO045	Total Metals
RTCC-2-T01N-PLTJ	Chokecherry	Juice	BIO045	Total Metals

The relative percent differences (RPDs) or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within QAPP acceptance limits. Based on the LD results, the overall level of precision demonstrated is considered to be acceptable.

4.3 SERIAL DILUTION RESULTS

The table below illustrates the site-samples that were used for the serial dilution test.

Sample ID	Matrix	Submatrix	Data Package	Analyses
RTCC-2-T01N-PLTB	Chokecherry	Berry	BIO045	Total Metals
RTCC-2-T01N-PLTJ	Chokecherry	Juice	BIO045	Total Metals
RRCC-2-T01N-PLTB	Chokecherry	Berry	BIO046	Total Metals

Only analyte concentrations greater than 50 times their CRDL are appropriate for comparing to the evaluation criteria. A number of %Ds between the original sample results and the result obtained from a sample diluted 1:5 were >10%. In general, if less than a quarter of the valid serial dilution results for a given metal were outside of the acceptance range, only the parent

samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that metal in all samples of the same matrix were qualified. However, additional factors such as the number of valid measurements relative to the size of the sample set and the magnitude of the outages were also taken into consideration. The table below summarizes the results for each analyte, the number of high and low exceedances, and the number of serial dilution results that were considered valid (i.e., the sample concentration was greater than 50 times their CRDL).

Analyte	Average % Ds	%Ds >10%	Potential Bias		Number of Valid Results	Action
			Low	High		
Aluminum		NA				None
Antimony		NA				None
Arsenic		NA				None
Barium		NA				None
Beryllium		NA				None
Boron		NA				None
Cadmium		NA				None
Calcium		NA				None
Chromium		NA				None
Cobalt		NA				None
Copper		NA				None
Iron		NA				None
Lead		NA				None
Manganese		NA				None
Magnesium		NA				None
Molybdenum		NA				None
Selenium		NA				None
Nickel		NA				None
Potassium	15.3	2	2	0	3	J/UJ DL – L SDs outside of limits were associated with the berry samples. All chokecherry berry results qualified.
Thallium		NA				None
Silver		NA				None
Sodium		NA				None
Vanadium		NA				None
Zinc		NA				None

The average % Ds associated with the two berry samples RRCC-2-T01N-PLTB and RTCC-2-T01N-PLTB was 18.4%, with a potential low bias. Therefore, all berry samples have been qualified as estimated, J/UJ DL-L.

The site-specific field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following section presents a discussion on the field duplicate results associated with the samples collected during the sampling event. No rinsate blank or field blank samples were associated with the collection of the chokecherry samples.

5.1 FIELD DUPLICATE RESULTS

One field duplicate sample per submatrix was collected during this sampling event. As there were 9 chokecherry tissue samples (9 berry samples and 9 juice samples), the frequency of field duplicate collection satisfied the QAPP requirement of 5%. The field duplicate pairs are listed in the table below.

Sample ID	Matrix	Submatrix	Data Package	Analyses
RTCC-1-T01N-PLTB/RTCC-1-T01D-PLTB	Chokecherry	Berry	BIO045	Total Metals
RTCC-1-T01N-PLTJ/RTCC-1-T01D-PLTJ	Chokecherry	Juice	BIO045	Total Metals

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤50% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL as the reporting limit. For field duplicate pairs where the sample or duplicate concentration was less than five times the reporting limits, the absolute difference between the sample and duplicate was compared to the criterion of ≤ four times the greater RL. The results for all analytes for the three field duplicate pairs satisfied the applicable evaluation criterion. Based on the FD results, the overall level of precision demonstrated is considered to be acceptable.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank contamination. Some sample results were qualified as estimated on the basis of the MS results. A general overall assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

One hundred percent of field duplicate results and 100% of the LD results satisfied the applicable criteria. As such, the overall level of precision demonstrated is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of LCSs and MS.

All of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP. As such, all of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP which is considered to be indicative of acceptable overall accuracy with respect to the analytical system.

Approximately, 98% of the MS spike recoveries satisfied the applicable evaluation criteria for accuracy specified in QAPP which is considered to be indicative of acceptable overall accuracy attained with respect to the site matrix.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

Ten chokecherry samples were submitted for metals analysis. All of the metal results for the ten samples analyzed (9 field samples and 1 field duplicates) are considered usable as qualified for meeting project objective. As such, the completeness for the samples analyzed is 100% which satisfies the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS,

2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the plants. The close agreement between the field duplicate results is considered to indicate that the samples collected are adequately representative of the medium sampled. Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. As noted in Section 6.1, 100% of the LD results satisfied the precision evaluation indicating that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

The sample results and reporting limits have been adjusted accordingly for the weight used for digestion. It is anticipated that all data will be usable in the risk assessment. Although no screening level criteria for plants were provided in the QAPP or the Baseline Ecological Risk Assessment to which RLs for nondetect analytes could be compared, non-detect sample results were evaluated against the ecological RBSL. All samples for antimony analyses were diluted 10x. All results were reported as non-detect at values above the ecological RBSL, and the data user will need to evaluate whether these results support data use objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO045 Sampling Event: Spring 2003

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Sheri O'Connor Date Completed: 11/16/03

Peer Reviewer: Geoff Webb Date Completed: 11/19/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses
				Metals
EB045B	RB	537326	B	X
EB045J	SA	537327	B	X
RMCC-1-T01N-PLTB	SA	537296	B	X
RMCC-1-T01N-PLTJ	SA	537297	B	X
RMCC-2-T01N-PLTB	SA	537302	B	X
RMCC-2-T01N-PLTJ	SA	537303	B	X
RMCC-3-T01N-PLTB	SA	537305	B	X
RMCC-3-T01N-PLTJ	SA	537306	B	X
RRCC-1-T01N-PLTJ	SA	537300	B	X
RRCC-1-T01N-PLTB	SA	537299	B	X
RTCC-1-T01D-PLTB	FD	537290	B	X
RTCC-1-T01D-PLTJ	FD	537291	B	X
RTCC-1-T01N-PLTB	SA	537287	B	X
RTCC-1-T01N-PLTJ	SA	537288	B	X
RTCC-2-T01N-PLTB[(1)]	MS	537284	B	X
RTCC-2-T01N-PLTJ[(1)]	MS	537285	B	X
RTCC-3-T01N-PLTB	SA	537293	B	X
RTCC-3-T01N-PLTJ	SA	537294	B	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank EB = Equipment Blank FB = Field Blank FD = Field Duplicate

[(1)+]Additional sample volume provided and used for matrix QC.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The chokecherry samples were prepared and analyzed per the provisions outlined in the memo prepared by URS dated August 8, 2003.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results, and their qualifications from these results are summarized in Table 1.1. One target analyte was detected in both equipment blanks (EB045J and EB045B) after accounting for method blank contamination. The qualifications from these results are summarized in Table 1.1.
Matrix QC • MS and LD RTCC-2-T01N-PLTB RTCC-2-T01N-PLTJ	No	One result for sample RTCC-2-T01N-PLTJ was qualified on the basis of matrix spike results. The results and actions are summarized in Table 1.2. All LD results satisfied the applicable concentration dependent evaluation criterion. The matrix spike and laboratory duplicate results for the chokecherries will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for the chokecherry samples.
Method QC • PDS and Serial Dilution RTCC-2-T01N-PLTB RTCC-2-T01N-PLTJ • Internal Standards	No	One metal result in the serial dilution analysis of RTCC-2-T01N-PLTB was outside of the ± 10% limits in the QAPP. These results and assigned qualification are summarized in Table 1.3. Recoveries for all post-digestion spikes were within the acceptance limits. The serial dilution results for the chokecherries will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for the chokecherry samples.
Field QC • Field Duplicate RTCC-1-T01N-PLTB/RTCC-1-T01D-PLTB RTCC-1-T01N-PLTJ/RTCC-1-T01D-PLTJ	Yes	All FD results satisfied the applicable concentration dependent evaluation criterion. The field QC results for the chokecherries will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for the chokecherry samples.
Nondetect Results w/ Elevated RLs?	No	All samples for antimony analysis were diluted 10x. Results were reported as non-detect at values above the ecological RBSL.
Package Completeness	Yes	
Other parameters Evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	**ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Laboratory Blank Results Outside Evaluation Criteria Resulting in Data Qualification

Analyte	CCB (µg/L)	MB (mg/Kg)	EB EB045J (mg/Kg)	EB EB045B (mg/Kg)	IDL (µg/L)	Sample Qualified	Qualification Code
Zinc			1.1	1.7	5.7	With the exception of RTCC-3-T01N-PLTJ, all zinc results	U EB-I
Beryllium		-0.031			0.2	All beryllium results	UJ MB -L
Iron	23.1 34.4 23.0				16.8	With the exception of RTCC-1-T01D-PLTJ and RTCC-2-T01N-PlTJ, all iron results	U CCB-I
Lead	1.5				1.5	EB045B EB045J RMCC-2-T01N-PLTJ RMCC-3-T01N-PLTB RMCC-3-T01N-PLTJ RRCC-1-T01N-PLTJ	U CCB-I
Nickel		-0.300			2.0	All nickel results	J/UJ MB-L
Silver	-1.2	-0.173			0.9	All silver results	UJ MB-L Or UJ CCB, MB-L
Sodium		73.67			218.8	All sodium results	U MB-I
Potassium		34.490			250	EB045J	

CCB – Continuing Calibration Blank **MB –** Method of Preparation Blank
IDL – Instrument Detection Limit for Metals **EB** Equipment Blank
Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2
Metal Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualification for Sample RTCC-2-T01N-PLTJ

Analyte	MS%R	Comment	Action
Iron	130	Parent sample result qualified	J MS-H

Evaluation criteria:
Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.3
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample RTCC-2-T01N-PLTB

Analyte	| % D |	Action
Potassium	18	J DL-L

QC limits ± 10 %

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO046 Sampling Event: Spring 2003

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 11/16/03

Peer Reviewer: Geoff Webb Date Completed: 11/19/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses
				Metals
EB046B	RB	539470	B	X
EB046J	RB	539471	B	X
RRCC-2-T01N-PLTB	SA	539462	B	X
RRCC-2-T01N-PLTJ	SA	539463	B	X
RRCC-4-T01N-PLTB	SA	539468	B	X
RRCC-4-T01N-PLTJ	SA	539469	B	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank EB = Equipment Blank FB = Field Blank FD = Field Duplicate

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The chokecherry samples were prepared and analyzed per the provisions outlined in the memo prepared by URS dated August 8, 2003.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample RRCC-3-T01N-PLT (RRCC-3-T01N-PLTB and RRCC-3-T01N-PLTJ) was cancelled.
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results, and their qualifications from these results are summarized in Table 1.1. Several target analytes were detected in the equipment blanks (EB046J and EB046B) after accounting for method blank contamination. The qualifications from these results are summarized in Table 1.1.
Matrix QC • MS and LD None	Not Applicable	This package did not include any matrix QC results. The matrix spike and laboratory duplicate results for the chokecherries will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for the chokecherry samples.
Method QC • PDS none • Serial Dilution RRCC-2-T01N-PLTB • Internal Standards	No	One metal result in the serial dilution analysis of RRCC-2-T01N-PLTB was outside of the ± 10% limits in the QAPP. These results and assigned qualification are summarized in Table 1.2. The serial dilution results for the chokecherries will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for the chokecherry samples.
Field QC • Field Duplicate	Not Applicable	This package did not include any field QC results. The field QC results for the chokecherries will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for the chokecherry samples.
Nondetect Results w/ Elevated RLs?	No	All samples for antimony analysis were diluted 10x. Results were reported as non-detect at values above the ecological RBSL.
Package Completeness	Yes	
Other parameters Evaluated based on case narrative comments or review of laboratory performance parameters.	No	The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum results of 176% and 197.6%. Associated aluminum results may potentially be biased high for values reported close the aluminum CRDL concentrations of 40 mg/kg. Sample data have been qualified on the basis of CRDL standards. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Laboratory Blank Results Outside Evaluation Criteria Resulting in Data Qualification

Analyte	CCB (µg/L)	MB (mg/Kg)	EB EB046J (mg/Kg)	EB EB046B (mg/Kg)	IDL (µg/L)	Sample Qualified	Qualification Code
Molybdenum		0.151			1.1	All detectable molybdenum results	U M-I
Sodium		253.3			453.8	All sodium results	U MB-I
Aluminum	38.7 38.5				22.1	RRCC-2-T01N-PLTB RRCC-4-T01N-PLTB	U CCB-I
Chromium			0.29	1.5	0.20	All chromium results	U EB-I
Zinc				0.27	2.3	RRCC-4-T01N-PLTB	U EB-I
Beryllium			0.045		0.4	RRCC-4-T01N-PLTJ RRCC-2-T01N-PLTJ	U EB-I
Iron			4.6		27.8	RRCC-4-T01N-PLTB	U EB-I
Potassium	-340				318.0	EB046B EB046J	J/UJ CCB-L

CCB – Continuing Calibration Blank **MB –** Method of Preparation Blank
IDL – Instrument Detection Limit for Metals **EB –** Equipment Blank
Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample RRCC-2-T01N-PLTB

Analyte	| % D |	Action
Potassium	18.7	J DL-L

QC limits ± 10 %

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE WILDLIFE IMPACT STUDY PLANT SAMPLES COLLECTED DURING THE 2003 SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

March 2004

URS

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Project No. 22236241.00100

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Non-Valid Matrix Spikes 3-1
3.2.2 Laboratory Performance Review (LPR) Findings 3-1

Section 4 Collective Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.2 Post-Digestion Spikes 4-3
4.3 Laboratory Duplicate Results (Precision Evaluation) 4-3
4.4 ICP Serial Dilution Results 4-4

Section 5 Field Quality Control Results 5-1

5.1 Field Duplicate Agreement 5-1
5.2 Rinsate Blank Results 5-2

Section 6 Overall Data Quality Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-2
6.4 Representativeness 6-2
6.5 Comparability 6-2
6.6 Sensitivity 6-3

TABLE OF CONTENTS

List of Tables

Table 1-1	Summary of Plant Samples Collected for the WIS Plant Sampling Event
Table 4-1	Field Samples Designated for Matrix QC Analysis
Table 4-2	Inorganics Matrix Spike Results
Table 4-3	Metals Matrix Spike Results
Table 4-4	Field Samples Designated for Laboratory Duplicate Analysis
Table 4-5	ICP Serial Dilution Results
Table 4-6	ICP Serial Dilution Overall Assessment
Table 5-1	Field Duplicate Samples Collected for the WIS Plant Sampling Event
Table 5-2	Summary of Field Duplicate Plant Sample Exceedances
Table 5-3	Summary of Rinsate Blank Samples Collected for the WIS Plant Sampling Event
Table 5-4	Summary of Rinsate Blank Results
Table 6-1	Summary of Precision Assessment for WIS Plants
Table 6-2	Summary of Accuracy Assessment for WIS Plants

Attachments

Attachment 1.1	Data Review Summary for Data Package WISB01
Attachment 1.2	Data Review Summary for Data Package WISB02
Attachment 1.3	Data Review Summary for Data Package WISB03
Attachment 1.4	Data Review Summary for Data Package WISB04
Attachment 1.5	Data Review Summary for Data Package WISB05
Attachment 1.6	Data Review Summary for Data Package WISB06
Attachment 1.7	Data Review Summary for Data Package WISB07
Attachment 1.8	Data Review Summary for Data Package WISB08
Attachment 1.9	Data Review Summary for Data Package WISB09
Attachment 1.10	Data Review Summary for Data Package WISB10
Attachment 1.11	Data Review Summary for Data Package WISB11
Attachment 1.12	Data Review Summary for Data Package WISB12
Attachment 1.13	Data Review Summary for Data Package WISB13
Attachment 1.14	Data Review Summary for Data Package WISB14

This Data Validation Report (DVR) provides a general overview of the usability of the plant chemical analytical data obtained during the WIS Plants sampling event at Molycorp Questa Mine in Questa, New Mexico. This report contains the results and process of the sample specific data reviews and collective evaluations for the plant samples collected in support of the Remedial Investigation/Feasibility Study (RI/FS) during the months of late May into June and September of 2003. The plant samples were collected during two seasonally determined periods, representing warm and cool seasons.

Plant samples were submitted to Severn Trent Laboratories (STL) Burlington in Colchester, Vermont for chemical analysis. A total of 220 plant samples applicable to the RIFS were collected from 17 locations as part of the Wildlife Impact Study (WIS). Therefore, samples were given WIS sample IDs. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods utilized were according to the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). Sample and QC results were reported in fourteen original packages. Table 1-1 summarizes the plant samples collected during this sampling event, along with the analyses performed on each sample and the accompanying QC samples.

Table 1-1
Summary of Plant Samples Collected for the WIS Plant Sampling Event

Sample Identification (SDG)	Total Metals	Inorganics		Sample Identification (SDG)	Total Metals	Inorganics
EB01 (WISB01)	X	X		WRBG-1-T02N-PLTW (WISB10)	X	X
EB02 (WISB02)	X	X		WRBG-2-T01N-PLTU (WISB02)	X	X
EB03 (WISB03)	X	X		WRBG-2-T01N-PLTW (WISB02)	X	X
EB04 (WISB04)	X	X		WRBG-2-T02N-PLTU (WISB02)	X	X
EB05 (WISB05)	X	X		WRBG-2-T02N-PLTW (WISB02)	X	X
EB06 (WISB06)	X	X		WRBG-3-T01N-PLTU (WISB10)	X	X
EB07 (WISB07)	X	X		WRBG-3-T01N-PLTW (WISB10)	X	X
EB08 (WISB08)	X	X		WRBG-3-T02N-PLTU (WISB10)	X	X
EB09 (WISB09)	X	X		WRBG-3-T02N-PLTW (WISB10)	X	X
EB10 (WISB10)	X	X		WRBG-4-T01N-PLTU (WISB10)	X	X
EB11 (WISB11)	X	X		WRBG-4-T01N-PLTW (WISB10)	X	X
EB12 (WISB12)	X	X		WRBG-4-T02N-PLTU (WISB11)	X	X
EB13 (WISB13)	X	X		WRBG-4-T02N-PLTW (WISB11)	X	X
EB14 (WISB14)	X	X		WRBS-1-T01N-PLTU(WISB08)	X	X
WRAS-1-T01N-PLTU (WISB13)	X, FD	X, FD		WRBS-1-T01N-PLTW(WISB08)	X, RB	X, RB
WRAS-1-T01N-PLTW (WISB13)	X	X		WRBS-1-T02N-PLTU (WISB08)	X	X
WRAS-1-T02N-PLTU (WISB13)	X	X		WRBS-1-T02N-PLTW (WISB08)	X	X
WRAS-1-T02N-PLTW (WISB13)	X	X		WRBS-2-T01N-PLTU (WISB02)	X	X
WRAS-2-T01N-PLTU (WISB13)	X	X		WRBS-2-T01N-PLTW (WISB02)	X	X
WRAS-2-T01N-PLTW (WISB13)	X	X		WRBS-2-T02N-PLTU (WISB02)	X	X
WRAS-2-T02N-PLTU (WISB13)	X	X		WRBS-2-T02N-PLTW (WISB02)	X	X
WRAS-2-T02N-PLTW (WISB13)	X	X		WRBS-3-T01N-PLTU (WISB04)	X,FD,MS/ LD,RB	X, FD,MS/LD,RB
WRAS-3-T01N-PLTU (WISB14)	X	X		WRBS-3-T01N-PLTW (WISB04)	X,FD,MS/ LD	X,FD,MS/LD
WRAS-3-T01N-PLTW (WISB13)	X	X		WRBS-3-T02N-PLTU (WISB04)	X	X
WRAS-3-T02N-PLTU (WISB14)	X	X		WRBS-3-T02N-PLTW (WISB04)	X	X
WRAS-3-T02N-PLTW (WISB13)	X	X		WRCW-1-T01N-PLTU (WISB09)	X	X
WRBG-1-T01N-PLTU (WISB10)	X	X		WRCW-1-T01N-PLTW (WISB09)	X	X

Table 1-1
Summary of Plant Samples Collected for the WIS Plant Sampling Event

Sample Identification (SDG)	Total Metals	Inorganics		Sample Identification (SDG)	Total Metals	Inorganics
WRBG-1-T01N-PLTW (WISB10)	X	X		WRCW-1-T02N-PLTU (WISB09)	X	X
WRBG-1-T02N-PLTU (WISB10)	X	X		WRCW-1-T02N-PLTW (WISB09)	X	X
WRCW-2-T01N-PLTU (WISB09)	X	X		WRSG-2-T02N-PLTW (WISB02)	X	X
WRCW-2-T01N-PLTW (WISB09)	X	X		WRSG-3-T01N-PLTU (WISB01)	X	X
WRCW-2-T02N-PLTU (WISB09)	X	X		WRSG-3-T01N-PLTW (WISB02)	X	X
WRCW-2-T02N-PLTW (WISB09)	X	X		WRSG-3-T02N-PLTU (WISB01)	X, RB	X, RB
WRCW-3-T01N-PLTU (WISB08)	X	X		WRSG-3-T02N-PLTW (WISB02)	X	X
WRCW-3-T01N-PLTW (WISB08)	X	X		WRWW-1-T01N-PLTU (WISB06)	X	X
WRCW-3-T02N-PLTU (WISB08)	X	X		WRWW-1-T01N-PLTW (WISB06)	X	X
WRCW-3-T02N-PLTW (WISB08)	X	X		WRWW-1-T02N-PLTU (WISB06)	X, RB, MS/LD	X, RB, MS/LD
WRFO-1-T01N-PLTU(WISB14)	X	X		WRWW-1-T02N-PLTW (WISB06)	X,MS/LD	X,MS/LD
WRFO-1-T01N-PLTW (WISB13)	X	X		WRWW-2-T01N-PLTU (WSIB05)	X, FD	X, FD
WRFO-1-T02N-PLTU (WISB14)	X	X		WRWW-2-T01N-PLTW (WISB05)	X, RB	X, RB
WRFO-1-T02N-PLTW (WISB13)	X	X		WRWW-2-T02N-PLTU (WISB05)	X	X
WRFO-2-T01N-PLTU(WISB13)	X	X		WRWW-2-T02N-PLTW (WISB05)	X	X
WRFO-2-T01N-PLTW (WISB13)	X	X		WRWW-3-T01N-PLTU (WISB03)	X, MS/LD, RB	X, MS/LD, RB
WRFO-2-T02N-PLTU (WISB14)	X	X		WRWW-3-T01N-PLTW (WISB03)	X, MS/LD	X, MS/LD
WRFO-2-T02N-PLTW (WISB13)	X	X		WRWW-3-T02N-PLTU (WISB04)	X, MS/LD	X, MS/LD
WRFO-3-T01N-PLTU (WISB13)	X	X		WRWW-3-T02N-PLTW (WISB04)	X, MS/LD	X, MS/LD
WRFO-3-T01N-PLTW (WISB13)	X	X		WTAS-1-T01N-PLTU (WISB12)	X	X
WRFO-3-T02N-PLTU (WISB13)	X	X		WTAS-1-T01N-PLTW (WISB11)	X	X
WRFO-3-T02N-PLTW (WISB13)	X	X		WTAS-1-T02N-PLTU (WISB12)	X	X
WRRR-1-T01N-PLTU (WISB04)	X, FD	X, FD		WTAS-1-T02N-PLTW (WISB11)	X	X
WRRR-1-T01N-PLTW (WISB04)	X, FD	X, FD		WTAS-2-T01N-PLTU (WISB12)	X	X
WRRR-1-T02N-PLTU (WISB04)	X,FD, MS/LD	X,FD, MS/LD		WTAS-2-T01N-PLTW (WISB11)	X	X
WRRR-1-T02N-PLTW (WISB04)	X, FD	X, FD		WTAS-2-T02N-PLTU (WISB12)	X	X
WRRR-2-T01N-PLTU (WISB08)	X	X		WTAS-2-T02N-PLTW (WISB11)	X	X
WRRR-2-T01N-PLTW (WISB08)	X	X		WTAS-3-T01N-PLTU (WISB12)	X	X
WRRR-2-T02N-PLTU (WISB08)	X	X		WTAS-3-T01N-PLTW (WISB11)	X	X
WRRR-2-T02N-PLTW (WISB08)	X	X		WTAS-3-T02N-PLTU (WISB12)	X	X
WRRR-3-T01N-PLTU (WSIB05)	X, RB	X, RB		WTAS-3-T02N-PLTW (WISB11)	X	X
WRRR-3-T01N-PLTW (WISB05)	X	X		WTBG-1-T01N-PLTU (WISB11)	X	X
WRRR-3-T02N-PLTU (WISB05)	X, RB	X, RB		WTBG-1-T01N-PLTW (WISB11)	X, FD	X, FD
WRRR-3-T02N-PLTW (WISB05)	X	X		WTBG-1-T02N-PLTU (WISB11)	X	X
WRSD-1R-T01N-PLTU (WISB10)	X, FD	X, FD		WTBG-1-T02N-PLTW (WISB11)	X	X
WRSD-1R-T01N-PLTW (WISB10)	X	X		WTBG-2-T01N-PLTU (WISB10)	X	X
WRSD-1R-T02N-PLTW (WISB10)	X	X		WTBG-2-T02N-PLTU (WISB10)	X	X
WRSD-2-T01N-PLTU (WISB06)	X	X		WTBG-2-T02N-PLTW (WISB10)	X	X
WRSD-2-T01N-PLTW (WISB06)	X, RB	X, RB		WTBG-3-T01N-PLTU (WISB12)	X	X
WRSD-2-T02N-PLTU (WISB06)	X	X		WTBG-3-T01N-PLTW (WISB12)	X	X
WRSD-2-T02N-PLTW (WISB06)	X	X		WTBG-3-T02N-PLTU (WISB12)	X, MS/LD	X, MS/LD
WRSD-3-T01N-PLTU (WISB04)	X	X		WTBG-3-T02N-PLTW (WISB12)	X, FD	X, FD
WRSD-3-T01N-PLTW (WISB04)	X	X		WTBS-1-T01N-PLTU (WISB08)	X	X
WRSD-3-T02N-PLTU (WISB04)	X	X		WTBS-1-T01N-PLTW (WISB08)	X	X
WRSD-3-T02N-PLTW (WISB04)	X	X		WTBS-1-T02N-PLTU (WISB08)	X	X

Table 1-1
Summary of Plant Samples Collected for the WIS Plant Sampling Event

Sample Identification (SDG)	Total Metals	Inorganics		Sample Identification (SDG)	Total Metals	Inorganics
WRSG-1-T01N-PLTU (WISB05)	X, MS/LD	X, MS/LD		WTBS-1-T02N-PLTW (WISB08)	X	X
WRSG-1-T01N-PLTW (WISB05)	X	X		WTBS-2-T01N-PLTU (WISB01)	X	X
WRSG-1-T02N-PLTU (WISB05)	X	X		WTBS-2-T01N-PLTW (WISB01)	X	X
WRSG-1-T02N-PLTW (WISB05)	X	X		WTBS-2-T02N-PLTU (WISB01)	X	X
WRSG-2-T01N-PLTU (WISB02)	X, FD	X, FD		WTBS-2-T02N-PLTW (WISB01)	X	X
WRSG-2-T01N-PLTW (WISB02)	X, FD	X, FD		WTBS-3-T01N-PLTU (WISB01)	X	X
WRSG-2-T02N-PLTU (WISB02)	X, RB	X, RB		WTBS-3-T01N-PLTW (WISB01)	X	X
WTBS-3-T02N-PLTU (WISB01)	X	X		WTSD-3-T01N-PLTU(WISB06)	X, RB	X, RB
WTBS-3-T02N-PLTW (WISB01)	X	X		WTSD-3-T01N-PLTW (WISB06)	X	X
WTCW-1-T01N-PLTU(WISB07)	X	X		WTSD-3-T02N-PLTU (WISB06)	X, RB	X, RB
WTCW-1-T01N-PLTW (WISB07)	X	X		WTSD-3-T02N-PLTW (WISB06)	X	X
WTCW-1-T02N-PLTU (WISB07)	X	X		WTSG-1-T01N-PLTU (WISB03)	X,FD,MS/ LD MSSMS/L D	X,FD,MS/LD
WTCW-1-T02N-PLTW (WISB07)	X	X		WTSG-1-T01N-PLTW (WISB03)	X,FD,MS/ LD,RB	X,FD,MS/LD,R B
WTCW-2-T01N-PLTU (WISB07)	X	X		WTSG-1-T02N-PLTU (WISB03)	X	X
WTCW-2-T01N-PLTW (WISB07)	X	X		WTSG-1-T02N-PLTW (WISB03)	X	X
WTCW-2-T02N-PLTU (WISB07)	X	X		WTSG-2-T01N-PLTU (WISB01)	X	X
WTCW-2-T02N-PLTW (WISB07)	X	X		WTSG-2-T01N-PLTW (WISB01)	X	X
WTCW-3-T01N-PLTU (WISB03)	X	X		WTSG-2-T02N-PLTU (WISB01)	X	X
WTCW-3-T01N-PLTW (WISB03)	X	X		WTSG-2-T02N-PLTW (WISB01)	X	X
WTCW-3-T02N-PLTU (WISB03)	X	X		WTSG-3-T01N-PLTU (WISB07)	X	X
WTCW-3-T02N-PLTW (WISB03)	X	X		WTSG-3-T01N-PLTW (WISB07)	X	X
WTFO-1-T01N-PLTU (WISB12)	X, MS/LD	X, MS/LD		WTSG-3-T02N-PLTU (WISB07)	X	X
WTFO-1-T01N-PLTW (WISB11)	X	X		WTSG-3-T02N-PLTW (WISB07)	X	X
WTFO-1-T02N-PLTU (WISB12)	X	X		WTWW-1-T01N-PLTU (WISB09)	X	X
WTFO-1-T02N-PLTW (WSIB11)	X	X		WTWW-1-T01N-PLTW (WISB09)	X	X
WTFO-2-T01N-PLTU (WISB12)	X	X		WTWW-1-T02N-PLTU (WISB09)	X	X
WTFO-2-T01N-PLTW (WISB11)	X	X		WTWW-1-T02N-PLTW (WISB09)	X	X
WTFO-2-T02N-PLTU (WISB12)	X	X		WTWW-2-T01N-PLTU (WISB01)	X, MS/LD	X, MS/LD
WTFO-2-T02N-PLTW (WISB11)	X	X		WTWW-2-T01N-PLTW (WISB01)	X	X
WTFO-3-T01N-PLTU (WISB12)	X	X		WTWW-2-T02N-PLTU (WISB01)	X	X
WTFO-3-T01N-PLTW (WISB11)	X	X		WTWW-2-T02N-PLTW (WISB01)	X	X
WTFO-3-T02N-PLTU (WISB12)	X	X		WTWW-3-T01N-PLTU (WISB07)	X	X
WTFO-3-T02N-PLTW (WISB11)	X	X		WTWW-3-T01N-PLTW (WISB07)	X	X
WTRR-1-T01N-PLTU (WISB06)	X, RB	X, RB		WTWW-3-T02N-PLTU (WISB07)	X	X
WTRR-1-T01N-PLTW (WISB06)	X	X		WTWW-3-T02N-PLTW (WISB07)	X	X
WTRR-1-T02N-PLTU (WISB06)	X, RB	X, RB				
WTRR-1-T02N-PLTW (WISB06)	X	X				
WTRR-2-T01N-PLTU (WISB07)	X	X				
WTRR-2-T01N-PLTW (WISB07)	X	X				
WTRR-2-T02N-PLTU (WISB07)	X	X				
WTRR-2-T02N-PLTW (WISB07)	X	X				
WTRR-3-T01N-PLTU (WISB03)	X,FD,MS/ LD,RB	X,FD,MS/L D,RB				
WTRR-3-T01N-PLTW (WISB03)	X,FD,MS/ LD	X,FD,MS/L D				
WTRR-3-T02N-PLTU (WISB03)	X, FD	X, FD				

Table 1-1
Summary of Plant Samples Collected for the WIS Plant Sampling Event

Sample Identification (SDG)	Total Metals	Inorganics		Sample Identification (SDG)	Total Metals	Inorganics
WTRR-3-T02N-PLTU (WISB03)	X, FD	X, FD				
WTRR-3-T02N-PLTW (WISB03)	X, FD	X, FD				
WTSD-1-T01N-PLTU(WISB06)	X	X				
WTSD-1-T01N-PLTW (WISB06)	X	X				
WTSD-1-T02N-PLTU(WISB06)	X	X		WIS Plants	Total Metals	Inorganics
WTSD-1-T02N-PLTW (WISB06)	X	X		Number of Plant Samples	220	220
WTSD-2-T01N-PLTU (WISB08)	X	X		Number of MS/LD	17	17
WTSD-2-T01N-PLTW (WISB08)	X	X		Number of Field Duplicates	19	19
WTSD-2-T02N-PLTU (WISB08)	X	X		Number of Rinsate Blanks*	19	19
WTSD-2-T02N-PLTW (WISB08)	X	X		Number of Equipment Blanks	14	14

*16 Rinsate Blank samples listed in table above. One rinsate blank, associated with the plant samples was taken after sample CR-14-T01N-PLTS. The remaining two rinsate blank samples were collected 09/08/03.

The data review process evaluated sample-specific and laboratory performance criteria in accordance with the standard operating procedure (SOP) 12.1. As mentioned in the SOP, all WIS data generated for the Questa Mine received an evaluation of sample-specific parameters. In addition, 10% of the data packages (per analysis type per event/episode) were reviewed for laboratory performance parameters. The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP12.1, was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Sample-specific reviews evaluated the following sample related parameters:

- Case narrative comments
- Chain-of-Custody/Sample Receipt
- Holding Times
- Method Blank (Preparation Blank)
- Matrix-Dependent Quality Control
  - Matrix Spike Analysis
  - Laboratory duplicate Analysis
- Method-Specific Quality Control Measures
  - Inorganic Method Specific QC Measures
    - Post Digestion Spike Analysis
    - ICP Serial Dilution Tests
    - Internal Standard Performance
    - Cation/Anion Balance Evaluation
- Total vs. Partial Balance
- Field quality control samples
  - Field Duplicate Agreement
  - Rinsate Blank Results

Evaluation of laboratory performance parameters provided an overall representation of the analytical system at the time the samples were analyzed. The laboratory performance review evaluated parameters in control of the laboratory, but independent of the field samples analyzed, as follows:

- Initial Calibration
- Continuing Calibration Verification
- Laboratory Control Sample Analysis
- Compound Identification
- Target Analyte Quantification
- Verification

- Method Specific Quality Control Checks
- Interference Check Standard

If any potential systematic problems were determined upon review of the laboratory performance parameters in any of the selected packages evaluated (meeting the 10% criteria), the review parameter was evaluated in all data packages for WIS Plants to determine the need for data qualification. Instances, in which professional judgment was exercised in evaluating the need for data qualification, the basis for this rationale was provided in the data review summary.

Upon completion of the sample-specific reviews and laboratory performance reviews, a collective assessment for the event was performed. Site-specific matrix spike, laboratory duplicate, serial dilution, blank (field and rinsate, when applicable), and field duplicate results were assessed collectively by matrix per event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered more representative of the site sample matrix and a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 3.0 describes sample specific data review findings and several data quality issues affecting all of the sediment packages. Section 4.0 presents the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Section 5.0 summarizes the collective summary of the field QC results (field and rinsate blanks, when applicable, and field duplicate results) and the resultant sample qualification. Lastly, an overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for data packages WISB01 through WISB14, for a total of 14 original data packages. In order to attain the frequency requirements for laboratory performance reviews, a total of two data packages (WISB07 and WISB13) were evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. All samples were also reviewed for the sample specific criteria described in section 2.0. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were identified that may globally affect all relevant plant samples analyzed for the WIS Plants Sampling Event. Although most of these issues have been addressed in the individual summary reports, these common issues and conclusions are summarized below:

3.2.1 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals, and the concentration of the spike was diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.2 Laboratory Performance Review (LPR) Findings

As mentioned previously, a full validation was conducted on two data packages to assess the performance of the laboratory for all analyses. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated in all packages for this event included metals evaluation of:

- Continuing Calibration Verification
- Laboratory Control Sample
- CRDL Standard

Inorganic parameter matrix QC consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. The site-specific matrix QC results were assessed collectively for the WIS Plants Sampling Event to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.3 present the collective matrix QC results associated with the samples in this event and the resultant data qualifiers.

Thirteen field plant samples were designated for total metals and inorganics matrix spike analyses, as listed in Table 4-1. The QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

Table 4-1
Field Samples Designated for Matrix QC Analysis

Sample ID (SDG)	Analyses	
	Total Metals	Inorganics[1]
WTWW-2-T01N-PLTU (WISB01)	X	X
WTRR-3-T01N-PLTU (WISB03)	X	X
WTRR-3-T02N-PLTW (WISB03)	X	X
WTSG-1-T01D-PLTU (WISB03)	X	X
WTSG-1-T01D-PLTW (WISB03)	X	X
WRWW-3-T01N-PLTU (WISB03)	X	X
WRWW-3-T01N-PLTW (WISB03)	X	X
WRWW-3-T02N-PLTU (WISB04)	X	X
WRWW-3-T02N-PLTW (WISB04)	X	X
WRWW-1-T02N-PLTU (WISB06)	X	X
WRWW-1-T02N-PLTW (WISB06)	X	X
WRBS-3-T01N-PLTU (WISB04)	X	X
WRBS-3-T01N-PLTW (WISB04)	X	X
WRRR-1-T02N-PLTU (WISB04)	X	X
WRSG-1-T01N-PLTU (WISB05)	X	X
WTFO-1-T01N-PLTU (WISB12)	X	X
WTBG-3-T02N-PLTU (WISB12)	X	X
Frequency:	7.7%	7.7%

[1]Matrix spike analyses for inorganics were performed on TKN only, as prescribed in the work plan

Table 4-2 summarizes the breakdown of frequency requirements for each of the analyses for the WIS Plants Sampling Event.

Table 4-2
Inorganics Matrix Spike Results

Analyte	Number of Valid Spikes/ Total Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
TKN	15	1	3	106.4	Qualifications to parent samples only

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results.

In general, qualification was limited to the parent sample if less than a quarter of the applicable matrix spike recoveries were outside the acceptance range. Conversely, if more than a quarter of the applicable matrix spike recoveries were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average matrix spike recovery, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

A number of MS recoveries were outside of the acceptance limits of 75-125% for both inorganics and metals. Tables 4-3 and 4-4 summarize the inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Eleven of the 15 valid spikes for TKN were recovered within the acceptance range. Of the four matrix spike recoveries outside of the evaluation criteria, two were below the limits, and two were above the limits. These recoveries are considered outliers to the overall performance with respect to the matrix. The overall quality of the TKN matrix spike results is considered acceptable. The parent samples for these four samples have been qualified as estimated.

Table 4-3
Metals Matrix Spike Results

Analyte	Number of Valid Spikes	Number of %R < 75%	Number of %R > 125%	Avg %R	Action
Aluminum	7	0	3	137.7	J MS-H to parent samples only
Antimony	10	3	0	73.8	J/UJ MS-L to parents sample only
Arsenic	10	0	0	94.1	None
Barium	10	0	0	102.1	None
Beryllium	10	0	0	103.8	None
Boron	10	1	0	97.4	J/UJ MS-L to parent sample only
Cadmium	10	2	0	81.5	J/UJ MS-L to parent samples only
Chromium	10	0	0	100.5	None
Cobalt	10	1	0	95.1	J/UJ MS-L to parent sample only
Copper	10	1	1	102.9	J/UJ MS-L, H to parent samples only
Iron	6	1	1	116.3	J/UJ MS-L, H to parent samples only
Lead	8	0	1	105.4	J MS-H to parent sample only
Manganese	9	1	1	106.9	J/UJ MS-L, H to parent samples only
Mercury	12	0	0	96.6	None
Molybdenum	9	2	0	82.5	J/UJ MS-L to parent samples only
Selenium	10	4	0	77.7	J/UJ MS-L to parent samples only
Nickel	10	0	0	101.4	None
Thallium	9	0	1	111.8	J MS-H to parent sample only
Silver	10	10	0	44.0	J/UJ MS-L all results WRRR-1-T02D-PLTU R MS-L (-24.8%R)
Vanadium	10	0	0	101.5	None
Zinc	10	0	0	98.0	None

Aluminum, antimony, boron, cadmium, cobalt, copper, iron, lead, manganese, molybdenum, selenium, and thallium results were qualified in the parent samples only, due to the low number

of exceedances relative to the total number of applicable samples and that fact that all average percent recoveries were within the acceptance range or only marginally out. The bias directions for copper, iron, manganese, and thallium in qualified parent results were a mix of both high and low biases, as applicable recoveries for these analytes were both below and in excess of the criteria range. As all ten silver matrix spike recoveries were reported below 75%, qualifications as estimated was extended to all silver results in this sampling event, with the exception of one silver result, which was rejected due to a –24.8% MS recovery. The accuracy of analyses relative to the site-specific matrix was considered acceptable.

4.2 POST-DIGESTION SPIKES

Post-digestion spikes (PDS) were conducted on all ICP and ICP/MS analytes to determine whether matrix spike recoveries outside of the acceptance range were the result of sample matrix, or due to a bias in the analytical system. All post digestion results for those analytes with matrix spike recoveries reported outside of the acceptance range were reviewed. All the associated PDS were recovered within the range of 75-125%. Therefore, no qualification of data was assigned for any of the metal analytes on the basis of post-digestion spike recovery, as it was likely that all matrix spike exceedances were due to a matrix effect on digestion rather than a bias in the analytical system.

4.3 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Laboratory duplicate sample results were evaluated to assess the precision of the laboratory analyses. Seventeen plant samples were designated for metals and inorganic parameter laboratory duplicate analyses, as listed in Table 4-4. The concentration-dependent evaluation criteria used are summarized in SOP 12.1. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

The RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were evaluated. As all of the laboratory duplicate evaluations met the QAPP criteria, and no qualification of results was necessary on the basis of laboratory duplicate disagreement. As such, the overall level of precision demonstrated is acceptable.

Table 4-4
Field Samples Designated for Laboratory Duplicate Analysis

Sample ID (SDG)	Analyses	
	Total Metals	Inorganics[1]
WRBS-3-T01N-PLTU (WISB04)	X	X
WRBS-3-T01N-PLTW (WISB04)	X	X
WRRR-1-T02N-PLTU (WISB04)	X	X
WRSG-1-T01N-PLTU (WISB05)	X	X
WRWW-1-T02N-PLTU (WISB06)	X	X
WRWW-1-T02N-PLTW (WISB06)	X	X

Table 4-4
Field Samples Designated for Laboratory Duplicate Analysis

Sample ID (SDG)	Analyses	
	Total Metals	Inorganics[1]
WRWW-3-T01N-PLTU (WISB03)	X	X
WRWW-3-T01N-PLTW (WISB03)	X	X
WRWW-3-T02N-PLTU (WISB04)	X	X
WRWW-3-T02N-PLTW (WISB04)	X	X
WTBG-3-T02N-PLTU (WISB12)	X	X
WTFO-1-T01N-PLTU (WISB12)	X	X
WTRR-3-T01N-PLTU (WISB03)	X	X
WTRR-3-T01N-PLTW (WISB03)	X	X
WTSG-1-T01N-PLTU (WISB03)	X	X
WTSG-1-T01N-PLTW (WISB03)	X	X
WTWW-2-T01N-PLTU (WISB01)	X	X
Frequency:	7.7%	7.7%

4.4 ICP SERIAL DILUTION RESULTS

ICP serial dilutions were performed on metal samples in every data package. These analyses were run on the same samples as were designated for matrix QC analyses, or otherwise randomly selected in data packages in which there were no QC samples designated. These analyses were used to evaluate whether or not significant physical or chemical interferences existed due to sample matrix. This was accomplished by analyzing the sample and a five-fold dilution of the sample. The percent difference (%D) between these two concentrations was compared for those analytes for which the serial dilution analysis was applicable (i.e., the initial concentrations were sufficiently higher (50x) than the IDL, accounting for dilution).

Table 4-5 summarizes each sample utilized for a serial dilution analysis, along with the analytes for which the sample concentration was greater than 50x the IDL (adjusted for dilutions).

Table 4-5
ICP Serial Dilution Results

Sample ID (SDG)	Applicable Analytes (%D>10% in bold)
WTWW-2-T01N-PLTU (WISB01)	Al, Ca, Cu, Fe, Mn, Mo, K, Ti, Zn
WRBS-2-T01N-PLTU (WISB02)	**Al (16.1),** Ca, Cu, Fe, Mg, Mn, K, Ti, Zn
WRSG-3-T01N-PLTW (WISB02)	Cr, Ni, Mo
WTRR-3-T01N-PLTW (WISB03)	B, Ca, **Fe (11.8),** Mg**, Ni (14.2**), Mn, Mo, **K (25),** Zn
WRWW-3-T01N-PLTU (WISB03)	Al, Ca, Fe, Pb, Mg, Mn, K, Ti
WRWW-3-T01N-PLTW (WISB03)	Al, Ca, Fe, Mg, Mn, K, Ti
WRBS-3-T01N-PLTU (WISB04)	Al, Ca, Cu, Fe, Pb, Mg, Mn, K, V **(16.4),** Ti
WRBS-3-T01N-PLTW (WISB04)	**Al (11.6),** Ca, Fe, Mn, **K (27.5),** Ti, **Zn (15.2)**
WRRR-1-T02D-PLTU (WISB04)	Al, **As (26.8),** Ba, Cr, Ca, Co, Cu, Fe, Pb, Mg, Ni, Mn, Mo, **Ag (14),** Na, Ti, **Zn (15.1)**
WRSG-1-T01N-PLTU (WISB05)	Al, Ca, Cu, Fe, Pb, Mg, Ni, Mn, K, Ti
WTRR-1-T01N-PLTU (WISB06)	**Al (12.8), Cd (16.4),** B, Ca, Cu, Fe, Pb, Mg, Ni, Mn, Mo, K, Ti, Zn

Sample ID (SDG)	Applicable Analytes (%D>10% in bold)
WTCW-2-T01N-PLTU (WISB07)	Al, Ca, Fe, Pb, Mg, Mn, Mo, **K (35.1),** V, Ti
WTSD-2-T01N-PLTU (WISB08)	Fe, Mg, Mn, Mo, K, Ti, Zn
WTSD-2-T01N-PLTW (WISB08)	---
WRCW-2-T01N-PLTU (WISB09)	Al, Ca, Fe, Mn, K, Ti
WTBG-2-T02N-PLTU (WISB10)	**Al (13.9), Ba (12.7), Be (10.5), Cr (16.1),** Ca, **Co (111),** Cu, **Fe (17.8), Pb (18.3), Mg (14.2), Ni (27.9), Mn (17.6), Mo (15), Tl (12.8), K (23.7), V (15.8),** Ti, **Zn (21.3)**
WRBG-4-T02N-PLTU (WISB11)	**Al (16.5), As (33.9), Ba (13.5), Cr (14.2), Ca (17), Co (84.6), Cu (12.5), Fe (15.2), Pb (22.8), Mg (15.8), Ni (15.9), Mn (18.1), K (30.2), V (14.2), Ti (14.6), Zn (18.9)**
WTFO-1-T01N-PLTU (WISB12)	Al, **As (15.1),** B, Cr, Ca, **Co (18.2),** Cu, Fe, Pb, Mg, Ni, Mn, Mo, **K (20.8), Ti (16.3),** Zn
WTBG-3-T02N-PLTU (WISB12)	**Al (15.4), Ba (13.1), Cd (82.7), Cr (16.6), Ca (17), Co (89.7), Cu (14.2), Fe (17.4), Pb (16.6), Mg (14.8), Ni (19.3), Mn (19.1), Mo (16.1), Ag (29.7), Tl (19.3), K (30.2), V (14.8), Ti (19), Zn (20)**
WRFO-2-T01N-PLTW (WISB13)	**Cr (13.6),** Ca, Fe, **Mg (11.8),** Mn, **Se (20.9), K (19.4),** Ti, **Zn (14.9)**
WRFO-2-T02N-PLTU (WISB14)	Al, Ba, Ca, Co, Cu, Fe, Mg, Ni, Mn, **K (18.7),** Ti, **Zn (21.1)**

Table 4-6 summarizes the average % Ds for each of the analytes, along with the percent of applicable analytes that exceeded control criteria (10%) for plant samples, and the resultant qualifiers based on the collective assessment. Where exceedances were identified, the diluted result is generally considered more accurate as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result. Qualifications were generally limited to the parent samples if less than a quarter of the valid serial dilution results were outside of the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set, the average %D, and the magnitude of outages were also taken into consideration.

Table 4-6
ICP Serial Dilution Overall Assessment

Analyte	Number of Valid Results	Number of %Ds >10%	% Valid Result >10%	Avg %D	Action
Aluminum	16	6	37.5	7.4	J DL-L to six parent samples only
Antimony	0	---	---	---	None
Arsenic	3	3	100%	25.3	J DL-L to three parent samples only
Barium	5	3	60.0%	9.0	J DL-L to three parent samples only
Beryllium	1	0	---	10.5	None
Boron	3	0	---	6.7	None
Cadmium	2	2	100%	49.6	J DL-L to two parent samples only
Calcium	18	2	11.1%	5.3	J DL-L to two parent samples only
Chromium	7	4	57.1%	10.4	J DL-L to four parent samples only
Cobalt	6	4	66.7%	53.0	J/UJ DL-L all samples*
Copper	12	2	16.7%	5.7	J DL-L to two parent samples only
Iron	19	4	21.1%	6.0	J DL-L to four parent samples only
Lead	10	3	30.0%	9.0	J DL-L to three parent samples only
Magnesium	16	4	25.0%	6.7	J DL-L to four parent samples only
Manganese	19	3	15.8%	5.5	J DL-L to three parent samples only

Table 4-6
ICP Serial Dilution Overall Assessment

Analyte	Number of Valid Results	Number of %Ds >10%	% Valid Result >10%	Avg %D	Action
Molybdenum	10	2	20.0%	5.1	J DL-L to two parent samples only
Nickel	10	4	40.0%	10.1	J DL-L to four parent samples only
Potassium	18	9	50.0%	15.4	J/UJ DL-L all samples*
Selenium	1	1	100%	20.9	J DL-L to one parent sample only
Silver	2	2	100%	21.9	J DL-L to two parent samples only
Sodium	1	0	---	8.4	None
Thallium	2	2	100%	16.1	J DL-L to two parent samples only
Vanadium	5	4	80.0%	12.4	J DL-L to four parent samples only
Zinc	13	7	53.8%	11.9	J DL-L to seven parent samples only
Titanium	18	3	16.7%	6.0	J DL-L to three parent samples only

*With the exception of those samples which reported acceptable serial dilution results.

Seventy-four of the 217 applicable serial dilution results were in excess of 10%. Only the parent samples were qualified for the majority of the analytes not meeting the evaluative criteria. Despite the average %Ds in excess of 10% for arsenic, cadmium, selenium, silver, thallium, and vanadium, the low number of results relative to the data set did not warrant global qualification because the percentage of valid %Ds were greater than a quarter of the applicable results, the average %Ds were less than 10%, or only marginally greater than 10% (10.5). Global qualification was not considered necessary for aluminum, barium, chromium, lead, magnesium and nickel. Copper, iron, molybdenum, and titanium results were qualified in the parent samples only, as the percent of valid results were less than a quarter of the total applicable results and the average %Ds were less than 10%. Qualfication was extended to all cobalt and potassium results, with the exception of those samples which exhibited acceptable %Ds for either analyte. The number of acceptable serial dilutions was a significant factor in determining the need for qualification in addition to the average %D for each analyte. It is considered that the serial dilution analyses did not indicate a pervasive matrix analyte problem.

Site-specific field duplicate samples and rinsate blanks were assessed collectively by matrix for the WIS Plants Sampling Event to determine the need for qualification of sample results of similar matrices. The sections to follow summarize the results for these QC samples and any collective qualifications arising from the assessments.

5.1 FIELD DUPLICATE AGREEMENT

The field duplicate agreement assessment evaluated the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, as follows. When both concentration results were sufficiently greater (5x) the RL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤50%. If one or both of the concentration results were less than 5x the RL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤3.5x the RL.

In general, qualification was limited to the parent sample if less than a quarter of the field duplicate results were outside the acceptance range. Conversely, if more than a quarter of the field duplicate results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the magnitude of the exceedances (marginal vs. gross) and the complexity of the sample matrix.

Nineteen field duplicate sample pairs were analyzed. The field duplicate sample pairs are listed in Table 5-1.

Table 5-1
Field Duplicate Samples Collected for the WIS Plant Sampling Event

Sample ID (SDG)	Analyses	
	Total Metals	Inorganics
WRAS-1-T01N/T01D-PLTU (WISB13)	X	X
WRBS-3-T01N/T01D-PLTU (WISB04)	X	X
WRBS-3-T01N/T01D-PLTW (WISB04)	X	X
WRRR-1-T01N/T01D-PLTU (WISB04)	X	X
WRRR-1-T01N/T01D-PLTW (WISB04)	X	X
WRRR-1-T02N/T02D-PLTU (WISB04)	X	X
WRRR-1-T02N/T02D-PLTW (WISB04)	X	X
WRSD-1R-T01N/T01D-PLTU (WISB10)	X	X
WRSG-2-T01N/T01D-PLTU (WISB02)	X	X
WRSG-2-T01N/T01D-PLTW (WISB02)	X	X
WRWW-2-T01N/T01D-PLTU (WSIB05)	X	X
WTBG-1-T01N/T01D-PLTW (WISB11)	X	X
WTBG-3-T02N/T02D-PLTW (WISB12)	X	X
WTRR-3-T01N/T01D-PLTU (WISB03)	X	X
WTRR-3-T01N/T01D-PLTW (WISB03)	X	X
WTRR-3-T02N/T02D-PLTU (WISB03)	X	X
WTRR-3-T02N/T02D-PLTW (WISB03)	X	X
WTSG-1-T01N/T01D-PLTU (WISB03)	X	X
WTSG-1-T01N/T01D-PLTW (WISB03)	X	X
Frequency:	8.6%	8.6%

With the exception of several metals from four field duplicate sample pairs, all field duplicate samples assessed for the WIS Plants Sampling Event were within the criteria specified in SOP 12.1 for metals and inorganics, with the exception of several metals. Table 5-2 summarizes the exceptions and resultant data qualifiers.

Table 5-2
Summary of Field Duplicate Plant Sample Exceedances

Analyte	Sample ID (SDG)	Criterion	Criterion Exceedances	Action
Aluminum	WRRR-1-T02N/T02D-PLTU (WISB04)	RPD ≤50%	108%	J FD-I for affected field duplicate samples only
Iron			119%	
Manganese			51%	
Chromium		|Diff| <3.5xRL	6.0 x RL	
Molybdenum			10.1 x RL	
Silver			3.5 x RL	
Sodium			7.6 x RL	
Potassium	WTSG-1-T01N/T01D-PLTW (WISB03)	RPD ≤50%	57%	
Aluminum	WTSG-1-T01N/T01D-PLTU (WISB03)	RPD ≤50%	52%	
Molybdenum	WTRR-3-T01N/T01D-PLTW (WISB03)	RPD ≤50%	60%	

Based on the relative minimal frequency of exceedances, it is considered that qualifications on the basis of field duplicate results were issued to the parent duplicate pairs only for all of the metal analytes summarized in Table 5-2 above.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blank samples associated with theWIS plants, RI/FS plants, and washed RI/FS plants have been evaluated together. The rinsate blank results for the RI/FS and WIS designated samples were obtained and analyzed as part of this sampling event. The rinsate blank results associated with the RI/FS plants and WIS plants samples have been evaluated together. The unwashed rinsate blank samples were applicable only to the unwashed plant samples. Table 5-3 summarizes the rinsate blank samples associated with the samples collected during the WIS Plants Sampling Event. The QAPP required frequency of 5% for the collection of rinsate blanks was met for the WIS Plants sampling event.

Table 5-3
Summary of Rinsate Blank Samples Collected for the WIS Plant Sampling Event

Sample ID (SDG)	Metals	Inorganics
UNWASHED		
RB01T-PLTS (WISS02)	X	X
RB02T-PLTG (WISS03)	X	X
RB03T-PLTS (WISS02)	X	X
RB04T-PLTS (WISS03)	X	X
RB05T-PLTG (WISS03)	X	X
RB06T-PLTG (WISS02)	X	X
RB07T-PLTS (WISS01)	X	X
RB08T-PLTG (WISS02)	X	X
RB09T-PLTG (WISS02)	X	X
RB10T-PLTS (WISS02)	X	X
RB11T-PLTS (WISS03)	X	X
RB12T-PLTG (WISS03)	X	X
Frequency:	10.9%	10.9%

Sample ID (SDG)	Metals	Inorganics
WASHED		
RB01T-WASH (WISS02)	X	X
RB02T-WASH (WISS02)	X	X
RB03T-WASH (WISS02)	X	X
RB04T-WASH (WISS03)	X	X
RB05T-WASH (WISS03)	X	X
RB01T-PLTW (WISS05)	X	X
RB02T-PLTW (WISS05)	X	X
Frequency:	6.4%	6.4%

The plant sampling event rinsate samples were submitted for analysis with other samples collected as part of the overall remedial investigation program. The validation of this data is included in the data review summaries for data packages WISS01, WISS02, WISS03, and WISS05 (WIS Soils). Table 5-4 summarizes the detected rinsate blank results, along with potential equivalent concentrations.

Table 5-4
Summary of Rinsate Blank Results

Analytes	RL	# of Detections	Total # of Rinsate Blanks	% Detections	Average Conc.	Equivalent Average Conc. (mg/kg)	X5 Criteria (mg/kg)	Sample Concentration Range (mg/kg)
UNWASHED								
Calcium	0.9	1	12	8.3%	326	27.2	136	929-13200
Copper	0.9	3	12	25%	1.52	0.13	0.65	1.9-84.1
Iron	33.3	2	12	16.7%	24.5	2.08	10.4	11.8-14200
Lead	0.1	2	12	16.7%	0.83	0.03	0.15	0.074-26.8
Manganese	.24	3	12	25%	0.14	0.01	0.05	2.5-499
Nickel	0.6	2	12	16.7%	0.59	0.02	0.10	0.06-14.3
Sodium	532	1	12	8.3%	292.1	24.3	122	17.8-536
Zinc	1.6	1	12	16.7%	2.76	0.23	1.15	5.2-98.3
WASHED								
Aluminum	22.1	2	7	28.6	19.42	0.65	3.25	11.6-13700
Calcium	287	1	7	14.3%	166	5.53	27.7	868-50000
Copper	0.9	1	7	14.3%	0.58	0.048	0.24	.48-41.2
Iron	27.7	1	7	14.3%	16.5	0.55	2.75	16.3-13000
Manganese	0.6	4	7	57%	1.17	0.09	0.45	2.5-499
Molybdenum	0.20	1	7	14.3%	0.14	0.004	0.02	0.12-87.1
Nickel	0.6	1	7	14.3%	1.03	0.03	0.15	0.17-15.5
Potassium	318	1	7	14.3%	188.14	6.27	31.4	6210-8040
TKN	.24	1	7	14.3%	0.24	0.24	1.2	1670-16800
Zinc	2.5	1	7	14.3%	1.7	0.06	0.30	5.2-98.3

None of the analytes were detected in greater than 25% of the total number of rinsate blanks. It is considered that low level of detected concentrations for these analytes in the plant samples may be attributable to contamination. Evaluation of the range of detected concentrations for each analyte reported in the rinsate blank samples provides an indication of the reasonable maximum likely contribution for each of these analytes. A conservative approach for calculating equivalent concentrations was undertaken. This was based on the assumption that all contamination found in the blank aliquot analyzed would also be present in the sample aliquot analyzed. In addition, considering the different environmental and rinsate blank preparation procedures, the maximum likely contributions for the detected analytes would be minimal. An average percent solids of 60% was used for these calculations.

Due to relative consistency and low levels of contaminations observed, no data was qualified on the basis of rinsate blank results. It is considered that these results are not indicative of systematic contamination.

All data were considered acceptable for use in meeting project objectives as qualified, with the exception of one silver result rejected on the basis of matrix spike recovery. Multiple sample results were qualified as nondetect on the basis of contamination identified in the laboratory blanks. Others were qualified as estimated on the basis of matrix spike and LCS results. Lastly, several data results were qualified as estimated on the basis of holding time exceedances, serial dilution results, or laboratory/field duplicate disagreements. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment for WIS Plants

Analysis Type	QC Measure	# of Analytes Measured	# Within Criteria	% Results within Criteria
Inorganics	FD	38	38	100%
	LD	34	34	100%
Metals	FD	494	484	97.9%
	LD	442	442	100%

The percentage of acceptable precision measurements ranged from 97.9% to 100% for all parameters. The overall level of precision demonstrated for all analyses collectively was considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Percent of MS recoveries meeting criteria are summarized in Table 6-2. Results for laboratory control samples (LCS) were reviewed for all metals as a result of unacceptable LCS recoveries discovered upon review of laboratory performance parameters. As such, the majority (91.7%) of selenium results were qualified as estimated due to low LCS recoveries.

Table 6-2
Summary of Accuracy Assessment for WIS Plants

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
Inorganics	MS	15	11	73.3%
Metals	MS	210	174	82.9%

The percentage of acceptable accuracy measurements ranged from 73.3% to 82.9%. The overall level of accuracy with respect to the site matrix demonstrated for all analyses collectively was considered to be acceptable.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results were considered usable as qualified for meeting project objectives, with the exception of one rejected silver result. As such, a percentage of 99.9% was calculated to represent the completeness of plant samples, which satisfied the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the plant samples collected during the WIS Plants sampling event. As relatively few data results were qualified on the basis of field duplicate disagreement, the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 5.2 indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample

preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analytes. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. While it is anticipated that all non-rejected data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB01 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 12/29/03

Peer Reviewer: Stacey Coker Date Completed: 12/30/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
EB01	EB	528985	B	X	X
WRSG-3-T01N-PLTU	SA	529062	B	X	X
WRSG-3-T02N-PLTU	SA	529063	B	X	X
WTBS-2-T01N-PLTU	SA	528975	B	X	X
WTBS-2-T01N-PLTW	SA	528978	B	X	X
WTBS-2-T02N-PLTU	SA	528979	B	X	X
WTBS-2-T02N-PLTW	SA	528980	B	X	X
WTBS-3-T01N-PLTU	SA	528971	B	X	X
WTBS-3-T01N-PLTW	SA	528972	B	X	X
WTBS-3-T02N-PLTU	SA	528973	B	X	X
WTBS-3-T02N-PLTW	SA	528974	B	X	X
WTSG-2-T01N-PLTU	SA	528981	B	X	X
WTSG-2-T01N-PLTW	SA	528982	B	X	X
WTSG-2-T02N-PLTU	SA	528983	B	X	X
WTSG-2-T02N-PLTW	SA	528984	B	X	X
WTWW-2-T01N-PLTU[1]	SA	528967	B	X	X
WTWW-2-T01N-PLTW	SA	528968	B	X	X
WTWW-2-T02N-PLTU	SA	528969	B	X	X
WTWW-2-T02N-PLTW	SA	528970	B	X	X

Matrix: B = Biota

QC Type: SA = Sample EB = Equipment Blank

*Modified inorganics list (TKN , % Solids)

[1]Additional volume collected and used for matrix QC.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses

were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

As mentioned in the laboratory case narrative, the selenium laboratory control sample (LCS) recovery of 60% was below the established control limits of 75-125%. However, this recovery was above the allowable limit of 50% established by the client (URS) for these samples. Therefore, the selenium results were qualified as estimated (J/UJ) to reflect the potential low bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The TKN analysis for sample WTWW-2-T02N-PLTU was performed 12 days outside the 28 day holding time. Therefore, the TKN result for sample WTWW-2-T02N-PLTU was qualified as estimated (J) with an indeterminate bias.
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results, and their qualifications from these results are summarized in Table 1.1. After accounting for method blank contamination, only chromium was detected in the equipment blank (EB01) at a concentration of 0.017 mg/kg. Data qualification was not considered necessary because all chromium results were reported at concentrations greater than five times the amount found in the equipment blank.
Matrix QC • MS and LD WTWW-2-T01N-PLTU • PDS WTWW-2-T01N-PLTU	No	Several metal results in the MS analysis were outside of the limits in the QAPP. The results and assigned qualification are summarized in Table 1.2. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for WIS plant samples.
Method QC • Serial Dilution WTWW-2-T01N-PLTU • Internal Standards	No	No metal results in the serial dilution analysis were outside of the ± 10% limits in the QAPP. Therefore, data qualification was not considered necessary. The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples.
Field QC • Field Duplicate • Rinsate Blank • Field Blank	NA	No field QC samples were analyzed with this data package. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	**CRDL –** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum recovery of 185.6% and iron recovery of 154.6%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum CRDL concentrations of 20 mg/kg and iron CRDL concentration of 10 mg/kg. Sample data have not been qualified on the basis of CRDL standards. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the IDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P)	44.2	33.5	53.7	72.9	1.199		EB01	U MB,CCB-I
Beryllium (P)	0.3	0.6	0.5	0.5	-0.011		EB01 WRSG-3-T01N-PLTU WTBS-2-T01N-PLTU WTBS-2-T01N-PLTW WTBS-2-T02N-PLTU WTBS-2-T02N-PLTW WTBS-3-T01N-PLTU WTBS-3-T01N-PLTW WTBS-3-T02N-PLTU WTBS-3-T02N-PLTW WTSG-2-T01N-PLTU WTSG-2-T01N-PLTW WTSG-2-T02N-PLTW WTWW-2-T01N-PLTU WTWW-2-T01N-PLTW	UJ MB-L Or UJ MB,CCB-L OR U CCB-I
Lead (P)					0.08		WRSG-3-T01N-PLTU WTBS-2-T01N-PLTU WTBS-3-T01N-PLTW WTBS-3-T02N-PLTW WTSG-2-T01N-PLTU	U MB-I
Lead (MS)					0.041		EB01 WTBS-2-T01N-PLTW WTSG-2-T01N-PLTW WTWW-2-T01N-PLTW	U MB-I
Nickel (MS)					-0.013		EB01	J/UJ MB-L
Sodium (P)	-658.1	-468.1	-620.7	-528.9			WRSG-3-T01N-PLTU WTBS-2-T01N-PLTU WTBS-2-T01N-PLTW WTBS-2-T02N-PLTU WTBS-3-T01N-PLTU WTBS-3-T01N-PLTW WTSG-2-T01N-PLTU WTSG-2-T01N-PLTW WTSG-2-T02N-PLTW	J/UJ CCB-L
Antimony (MS)	1.2	1.0	0.9	0.9			WRSG-3-T02N-PLTU WTBS-2-T02N-PLTU WTBS-3-T02N-PLTU WTBS-3-T02N-PLTW WTSG-2-T02N-PLTU WTWW-2-T02N-PLTU WTWW-2-T02N-PLTW	U CCB-II

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WTWW-2-T01N-PLTU

Analyte	MS%R	Comment	Action
Iron	35.2	Parent sample result qualified.	J MS-L
Silver	54.6	Parent sample result qualified	J MS-L

Evaluation criteria:

Matrix Spike % Recovery Limit 75 – 125 % for metals

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB02 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 1/6/04

Peer Reviewer: Geoff Webb Date Completed: 01/22/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
WRSG-3-T01N-PLTW	SA	529064	B	X	X
WRSG-3-T02N-PLTW	SA	529065	B	X	X
WRBS-2-T01N-PLTU	SA	529070	B	X	X
WRBS-2-T02N-PLTU	SA	529071	B	X	X
WRBS-2-T01N-PLTW	SA	529072	B	X	X
WRBS-2-T02N-PLTW	SA	529073	B	X	X
WRBG-2-T02N-PLTU	SA	529075	B	X	X
WRBG-2-T01N-PLTW	SA	529076	B	X	X
WRBG-2-T02N-PLTW	SA	529077	B	X	X
WRSG-2-T01N-PLTU	SA	529078	B	X	X
WRSG-2-T01D-PLTU	FD	529079	B	X	X
WRSG-2-T02N-PLTU	SA	529080	B	X	X
WRSG-2-T01N-PLTW	SA	529081	B	X	X
WRSG-2-T01D-PLTW	FD	529082	B	X	X
WRSG-2-T02N-PLTW	SA	529083	B	X	X
EB02	EB	529084	B	X	X
WRBG-2-T01N-PLTU	SA	529074	B	X	X

Matrix: B = Biota

QC Type: SA = Sample EB = Equipment Blank FD = Field Duplicate

*Modified inorganics list (TKN , % Solids)

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses

were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

As mentioned in the laboratory case narrative, the selenium laboratory control sample (LCS) recovery of 68% was below the established control limits of 75-125%. However, this recovery was above the allowable limit of 50% established by the client (URS) for these samples. Therefore, the selenium results were qualified as estimated (J/UJ) to reflect the potential low bias.

Analytical results for samples WRSD-1-T01N-PLTU, WRSD-1-T02N-PLTU, WRSD-1-T01N-PLTW, and WRSD-1-T02N-PLTW are not included in this submittal, as there was insufficient sample material remaining for the metals analysis. These samples will be re-collected at a later date.

Percent solids results are not provided in this submittal for samples WRBG-2-T02N-PLTU, WRBG-2-T02N-PLTW, WRSG-2-T02N-PLTU, and WRSG-2-T02N-PLTW, as insufficient sample volume remained after the completion of the remaining analyses.

Due to limited sample volume remaining for samples WRBG-2-T02N-PLTU, WRSG-2-T02N-PLTU, and WRSG-2-T02N-PLTW, the ICP/MS digestate was also used for the Trace ICP analysis. Insufficient sample volume remained to perform the Trace ICP digestions for these samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results, and their qualifications from these results are summarized in Table 1.1. After accounting for method blank contamination, no target analytes were detected in the equipment blank (EB02).
Matrix QC • MS and LD None • PDS None	NA	This package does not include any site-specific matrix quality control samples. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Serial Dilution WRBS-2-T01N-PLTU WRSG-3-T01N-PLTU • Internal Standards	No	One metal result for sample WRBS-2-T01N-PLTU in the serial dilution analysis was outside of the ± 10% limits in the QAPP. The results and assigned qualification are summarized in Table 1.2. The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples. The yttrium internal standard recoveries for several samples were outside the acceptance limits of 30-120%. Therefore, the laboratory reprocessed the molybdenum data using indium as the internal standard. All indium recoveries were within the acceptable limits. Accordingly, data qualification was not necessary.
Field QC • Field Duplicate WRSG-1-T01N-PLTU/WRSG-1-T01D-PLT WRSG-2-T01N-PLTW/WRSG-2-T01D-PLTW • Rinsate Blank • Field Blank	Yes	All analytes for the field duplicate pairs satisfied the applicable concentration dependent criterion expressed in the QAPP. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	**CRDL –** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum result 276%, 171%, and 168.9%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum CRDL concentrations of 20 mg/kg (ICP digestate) and 8 mg/kg (ICP-MS digestate). Sample data have not been qualified on the basis of CRDL standards. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the IDL. However, samples WRBG-2-T02N-PLTU and WRSG-2-T02N-PLTU reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. The results and assigned qualification are summarized in Table 1.3. **CCV –** Three silver CCVs exceeded the upper limit of the acceptance range of 90-110% with recoveries of 110.5%, 111%, and 112%. Therefore, with the exception of sample WRSG-3-T01N-PLTW, all detectable silver results were qualified as estimated (J) to reflect the potential high bias. **LCS –** The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 68%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
Beryllium		0.3	0.3 0.3	-0.4	0.017 0.005	0.2	WRSG-3-T01N-PLTW WRBS-2-T02N-PLTW WRBG-2-T02N-PLTW WRSG-2-T01N-PLTW WRBG-2-T01N-PLTU	U MB-I OR U CCB, MB-I
Sodium					29.570 11.632	218.8	WRSG-3-T01N-PLTW WRBS-2-T01N-PLTU WRBS-2-T02N-PLTU WRBS-2-T01N-PLTW WRBS-2-T02N-PLTW WRBG-2-T021N-PLTW WRBG-2-T02N-PLTW WRSG-2-T01N-PLTU WRSG-2-T01N-PLTW EB02 WRBG-2-T01N-PLTU	U MB- I

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony	0.6 0.6	0.6			0.016	0.5	WRSG-3-T02N-PLTW WRBS-2-T01N-PLTU WRBS-2-T02N-PLTU WRBS-2-T01N-PLTW WRBS-2-T02N-PLTW WRNG-2-T02N-PLTU WRBG-2-T02N-PLTW WRSG-2-T02N-PLTU WRSG-2-T02N-PLTW	U CCB-I OR U CCB, MB-I
Boron				5.6		4.6	WRSG-2-T01D-PLTU EB02	U CCB-I
Aluminum					9.215	18.3	WRSG-2-T01N-PLTW WRSG-2-T01D-PLTW	U MB-I
Chromium					0.016	0.10	EB02	U MB-I
Lead					0.003	0.10	EB02	U MB-I
Potassium			262			250	EB02	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WRBS-2-T01N-PLTU

Analyte	| % D |	Action
Aluminum	16.1	J DL-L

QC limits ± 10 %

Table 1.3
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Antimony	2	0.5	WRBG-2-T02N-PLTU WRSG-2-T02N-PLTU	J ICSA-H

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB03 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 1/6/04

Peer Reviewer: Geoff Webb Date Completed: 01/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
EB03	EB	529626	B	X	X
WRWW-3-T01N-PLTU[1]	SA	529624	B	X	X
WRWW-3-T01N-PLTW[1]	SA	529625	B	X	X
WTCW-3-T01N-PLTU	SA	529614	B	X	X
WTCW3-T01N-PLTW	SA	529615	B	X	X
WTSG-1-T02N-PLTU	SA	529622	B	X	X
WTCW-3-T02N-PLTU	SA	529616	B	X	X
WTCW-3-T02N-PLTW	SA	529617	B	X	X
WTSG-1-T02N-PLTW	SA	529623	B	X	X
WTSG-1-T01N-PLTW	SA	529620	B	X	X
WTSG-1-T01D-PLTW[1]	FD	529621	B	X	X
WTSG-1-T01N-PLTU	SA	529618	B	X	X
WTSG-1-T01D-PLTU[1]	FD	529619	B	X	X
WTRR-3-T02D- PLTW	FD	529613	B	X	X
WTRR-3-T02N-PLTW	SA	529612	B	X	X
WTRR-3-T02N-PLTU	SA	529610	B	X	X
WTRR-3-T02D-PLTU	FD	529611	B	X	X
WTRR-3-T01N-PLTW[1]	SA	529608	B	X	X
WTRR-3-T01D-PLTW	FD	529609	B	X	X
WTRR-3-T01N-PLTU[1]	SA	529606	B	X	X
WTRR-3-T01D-PLTU	FD	529607	B	X	X

Matrix: B = Biota

QC Type: SA = Sample EB = Equipment Blank FD = Field Duplicate

*Modified inorganics list (TKN , % Solids)

[1]Additional sample volume collected and used for matrix QC.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

As mentioned in the laboratory case narrative, the selenium recovery of 60% was below the established control limits of 75-125%. However, this recovery was above the allowable limit of 50% established by the client (URS) for these samples. Therefore, the selenium results were qualified as estimated (J/UJ) to reflect the potential low bias.

The ICV associated with sample WRWW-3-T01N-PLTU exceeded the acceptance limit 90-110% with a recovery of 113.6%. Data qualification was not considered necessary because the CCVs that bracketed the sample were within the acceptance limits.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The original TKN analysis of sample WRWW-3-T01N-PLTWMS yielded a matrix spike recovery below control criteria. The parent samples was reanalyzed in association with a second matrix spike and replicate two days outside the holding time requirement of 28 days. Therefore, the TKN result for sample WRWW-3-T01N-PLTW was qualified as estimated (J) with an indeterminate bias.
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results, and their qualifications from these results are summarized in Table 1.1. After accounting for method blank contamination, two target analytes were detected in the equipment blank (EB02). The affected samples, results, and their qualifications from these results are summarized in Table 1.1.
Matrix QC • MS and LD WTRR-3-T01N-PLTW (TKN) WTRR-3-T02N-PLTW (TKN) WTSG-1-T01D-PLTU (TKN) WTSG-1-T01D-PLTW (TKN) WRWW-3-T01N-PLTU WRWW-3-T01N-PLTW • PDS WRWW-3-T01N-PLTU WRWW-3-T01N-PLTW	NA	Several metal results in the MS analysis were outside of the limits in the QAPP. The results and assigned qualification are summarized in Table 1.2a-1.2d. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment for WIS plant samples.
Method QC • Serial Dilution WTRR-3-T01N-PLTW WRWW-3-T01N-PLTU WRWW-3-T01N-PLTW • Internal Standards	No	Two metal results for sample WTRR-3-T01N-PLTW in the serial dilution analysis were outside of the ± 10% limits in the QAPP. The results and assigned qualification are summarized in Table 1.3. The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate WTRR-3-T01N-PLTU/WTRR-3-T01D-PLTU WTRR-3-T01N-PLTW/WTRR-3-T01D-PLTW WTRR-3-T02N-PLTU/WTRR-3-T02D-PLTU WTRR-3-T02N-PLTW/WTRR-3-T02D-PLTW WTSG-1-T01N-PLTU/WSTG-1-T01D-PLTU WTSG-1-T01N-PLTW/WTSG-1-T01D-PLTW • Rinsate Blank • Field Blank	Yes	With three exceptions, all analytes for the field duplicate pairs satisfied the applicable concentration dependent criterion expressed in the QAPP. The results and assigned qualification are summarized in Tables 1.4a-1.4c. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	**CRDL –** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum results 172.9%and 172.7% and iron results 168.4% and 168.5%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum CRDL concentrations of 20 mg/kg and iron CRDL concentration of 10 mg/kg. Sample data have not been qualified on the basis of CRDL standards. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the IDL. However, two samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. The results and assigned qualification are summarized in Table 1.5. **LCS –** The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 60%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	EB (mg/kg)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
Lead							0.005	0.1	EB03	U MB-I
Sodium							22.135	218.8	EB03 WRWW-3-T01N-PLTU WTCW-3-T01N-PLTU WTCW-3-T01N-PLTW WTSG-1-T02N-PLTW WTSG-1-T01D-PLTW WTSG-1-T01N-PLTU WTSG-1-T01D-PLTU WTRR-3-T01N-PLTW WTRR-3-T01D-PLTW WTRR-3-T01N-PLTU	U MB-I

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	EB (mg/kg)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
Zinc						9.7		5.7	WRWW-3-T01N-PLTU WRWW-3-T01N-PLTW WTCW-3-T01N-PLTU WTCW-3-T01N-PLTW WTSG-1-T02N-PLTU WTCW-3-T02N-PLTW WTSG-1-T02N-PLTW WTSG-1-T01N-PLTW WTSG-1-T01D-PLTW WTSG-1-T01N-PLTU WTSG-1-T01D-PLTU WTRR-3-T02D-PLTW WTRR-3-T02N-PLTW WTRR-3-T02D-PLTU WTRR-3-T02N-PLTU WTRR-3-T01N-PLTW WTRR-3-T01D-PLTW WTRR-3-T01N-PLTU WTRR-3-T01D-PLTU	U EB-I
Antimony		0.9						0.5	WRWW-3-T01N-PLTU	U CCB-I
Beryllium	0.3		0.3	0.3	0.4			0.2	WRWW-3-T01N-PLTU WTCW-3-T01N-PLTU WTSG-1-T02N-PLTW WTRR-3-T02D-PLTU	

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2a
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WTRR-3-T01N-PLTW

Analyte	MS%R	Comment	Action
TKN	145	Parent sample result qualified	J MS-H

Evaluation criteria:

Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.2b
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WRWW-3-T01N-PLTU

Analyte	MS%R	Comment	Action
Aluminum	151.5	Parent sample result qualified	J MS-H
Lead	126	Parent sample result qualified	J MS-H
Silver	41.9	Parent sample result qualified	J/UJ MS-L

Evaluation criteria:

Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.2c
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WRWW-3-T01N-PLTUW

Analyte	MS%R	Comment	Action
Silver	42.8	Parent sample result qualified	J/UJ MS-L

Evaluation criteria:
Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.3
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WTRR-3-T01N-PLTW

Analyte	| % D |	Action
Iron	11.8	J DL-L
Potassium	25	

QC limits ± 10 %

Table 1.4a
Field Duplicate Pair Results Outside Evaluation Criteria Resulting in Data Qualification for WTSG-1-T01N-PLTW/ WTSG-1-T01D-PLTW

Analyte	WTSG-1-T01N-PLTW (mg/kg)	WTSG-1-T01D-PLTW (mg/kg)	RPD (%)	Action
Potassium	7270	4630	57	J FD-I

RPD Criteria ≤50% EQL = Estimation Quantitation Limit

Table 1.4b
Field Duplicate Pair Results Outside Evaluation Criteria Resulting in Data Qualification for WTSG-1-T01N-PLTU/ WTSG-1-T01D-PLTU

Analyte	WTSG-1-T01N-PLTU (mg/kg)	WTSG-1-T01D-PLTU (mg/kg)	RPD (%)	Action
Aluminum	81.8	139	52	J FD-I

RPD Criteria ≤50% EQL = Estimation Quantitation Limit

Table 1.4c
Field Duplicate Pair Results Outside Evaluation Criteria Resulting in Data Qualification for WTRR-3-T01N-PLTW/ WTRR-3-T01D-PLTW/

Analyte	WTRR-3-T01N-PLTW (mg/kg)	WTRR-3-T01D-PLTW (mg/kg)	RPD (%)	Action
Molybdenum	37.2	20	60	J FD-I

RPD Criteria ≤50% EQL = Estimation Quantitation Limit

Table 1.5
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Antimony	2	0.5	WTSG-1-T02N-PLTU WTCW-3-T02N-PLTU	J ICSA-H

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB04 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 1/7/04

Peer Reviewer: Geoff Webb Date Completed: 01/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
EB04		529732	B	X	X
WRBS-3-T01D-PLTU	FD	529719	B	X	X
WRBS-3-T01D-PLTW	FD	529721	B	X	X
WRBS-3-T01N-PLTU[1]	SA	529718	B	X	X
WRBS-3-T01N-PLTW[1]	SA	529720	B	X	X
WRBS-3-T02N-PLTU	SA	529722	B	X	X
WRBS-3-T02N-PLTW	SA	529723	B	X	X
WRRR-1-T01D-PLTU	FD	529725	B	X	X
WRRR-1-T01D-PLTW	FD	529727	B	X	X
WRRR-1-T01N-PLTU	SA	529724	B	X	X
WRRR-1-T01N-PLTW	SA	529726	B	X	X
WRRR-1-T02D-PLTU	SA	529729	B	X	X
WRRR-1-T02D-PLTW	FD	529731	B	X	X
WRRR-1-T02N-PLTU	SA	529728	B	X	X
WRRR-1-T02N-PLTW	SA	529730	B	X	X
WRSD-3-T01N-PLTU	SA	529714	B	X	X
WRSD-3-T01N-PLTW	SA	529715	B	X	X
WRSD-3-T02N-PLTU	SA	529716	B	X	X
WRSD-3-T02N-PLTW	SA	529717	B	X	X
WRWW-3-T02N-PLTU[1]	SA	529712	B	X	X
WRWW-3-T02N-PLTW[1]	SA	529713	B	X	X

Matrix: B = Biota

QC Type: SA = Sample EB = Equipment Blank FD = Field Duplicate

*Modified inorganics list (TKN , % Solids)

[1]Additional sample volume collected and used for matrix QC.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

As mentioned in the laboratory case narrative, the selenium recovery for the LCS was below the established control limits of 75-125%, . However, this recovery was above the allowable limit of 52% established by the client (URS) for these samples. Therefore, the selenium results were qualified as estimated (J/UJ) to reflect the potential low bias.

The internal standard for the CCVs associated with sample EB04 exceeded the acceptance limit 30-120% with recoveries of 121.8% and 125.2%. Data qualification was not considered necessary because the CCV was within the acceptance limits.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The TKN analysis for samples WRWW-1-T01N-PLTW, WRRR-1-T01D-PLTW, WRRR-1-T02N-PLTU, WRRR-1-T02D-PLTU, WRRR-1-T02N-PLTW, AND WRRR-1-T02D-PLTW were analyzed one to two days outside the holding time requirement of 28 days. Therefore, the TKN results for these samples were qualified as estimated (J) with an indeterminate bias.
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results, and their qualifications from these results are summarized in Table 1.1. After accounting for method blank contamination, zinc and TKN were detected in the equipment blank (EB04). The affected samples, results, and their qualifications from these results are summarized in Table 1.1. TKN carryover from the laboratory preparation equipment resulted in qualification of several samples as estimated (J EB-H). Qualification as nondetect was not considered appropriate, as TKN is inherent to plants.
Matrix QC • MS and LD WRWW-3-T02N-PLTU (TKN & Mercury) WRWW-3-T02N-PLTW (TKN & Mercury) WRBS-3-T01N-PLTU WRBS-3-T01N-PLTW • PDS WRBS-3-T01N-PLTU WRBS-3-T01N-PLTW	NA	Several metal results in the MS analysis were outside of the limits in the QAPP. The results and assigned qualification are summarized in Tables 1.2a-1.2c. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment for WIS plant samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Serial Dilution WRBS-3-T01N-PLTU WRBS-3-T01N-PLTW WRWW-1-T02D-PLTU • Internal Standards	No	Several metal results in the serial dilution analysis were outside of the ± 10% limits in the QAPP. The results and assigned qualification are summarized in Tables 1.3a-1.3b. The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples. The internal standard recoveries for several samples were outside the acceptance limits of 30-120%. Therefore, the laboratory reprocessed the molybdenum data using indium as the internal standard. All indium recoveries were within the acceptable limits. Accordingly, data qualification was not necessary.
Field QC • Field Duplicate WRBS-3-T01N-PLTU/WRBS-3-T01D-PLTU WRBS-3-T01N-PLTW/WRBS-3-T01D-PLTW WRRR-1-T01N-PLTU/WRRR-1-T01D-PLTU WRRR-1-T01N-PLTW/WRRR-1-T01D-PLTW WRRR-1-T02N-PLTU/WRRR-1-T02D-PLTU WRRR-1-T02N-PLTW/WRRR-1-T02D-PLTW • Rinsate Blank • Field Blank	Yes	With several exceptions, all analytes for the field duplicate pairs satisfied the applicable concentration dependent criterion expressed in the QAPP. The results and assigned qualification are summarized in Tables 1.5. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	**CRDL –** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum results 193.5%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum CRDL concentrations of 20 mg/kg. Sample data have not been qualified on the basis of CRDL standards. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the IDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. **LCS –** The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 52%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	EB (mg/kg)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum		37.2	37.2	46.6	61.8			18.3	EB04	U CCB-I
Chromium			0.6				0.05	0.6	EB04	U MB-I
Sodium		227.1	455.6				32.635	218.8	EB04 WRBS-3-T01D-PLTU WRBS-3-T01D-PLTW WRBS-3-T01N-PLTU WRBS-3-T01N-PLTW WRBS-3-T02N-PLTU WRBS-3-T02N-PLTW WRRR-1-T01D-PLTU WRRR-1-T01D-PLTW WRRR-1-T01N-PLTU WRRR-1-T01N-PLTW WRRR-1-T02D-PLTW WRSD-3-T01N-PLTU WRSD-3-T01N-PLTW WRSD-3-T02N-PLTW WRWW-3-T02N-PLTU WRWW-3-T02N-PLTW	U MB-I OR U MB,CCB-I
Zinc						1.2		1.0	WRRR-1-T02D-PLTW	U EB-I
Beryllium		0.3	0.3	0.2				0.2	WRBS-3-T01D-PLTU WRBS-3-T01N-PLTU WRRR-1-T02N-PLTU WRSD-3-T01N-PLTU WRWW-3-T02N-PLTW	U CCB-I
Antimony	0.6	1.4	1.2	1.0	0.8		0.01	0.5	WRBS-3-T02N-PLTU WRRR-1-T02D-PLTU WRRR-1-T02N-PLTU WRRR-1-T02N-PLTU WRSD-3-T01N-PLTU WRSD-3-T02N-PLTU WRSD-3-T02N-PLTW WRWW-3-T02N-PLTU WRWW-3-T02N-PLTW	
TKN						0.60		0.24	WRBS03-T02N-PLTW WRRR-1-T02D-PLTU	J EB-H

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2a
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WRBS-3-T01N-PLTU

Analyte	MS %R	PDS %R	Comment	Action
Aluminum	198.2		Parent sample result qualified	J MS-H
Cadmium	71.5	73.8	Parent sample result qualified	J/UJ MS-L
Selenium	67.9	65.7	Parent sample result qualified	J/UJ MS-L
Silver	55		Parent sample result qualified	J/UJ MS-L

Evaluation criteria:

Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.2b
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WRBS-3-T01N-PLTU

Analyte	MS %R	PDS %R	Comment	Action
Selenium	66.3	62.8	Parent sample result qualified	J/UJ MS-L
Silver	49.3		Parent sample result qualified	J/UJ MS-L

Evaluation criteria:

Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.2c
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WRWW-1-T02D-PLTU

Analyte	MS %R	PDS %R	Comment	Action
Selenium	57.1	61.3	Parent sample result qualified	J/UJ MS-L
Silver	-24.8	73.5	Parent sample result qualified	R MS-L
Molybdenum	41.4	54.5	Parent sample result qualified	J/UJ MS-L
Manganese	71.3		Parent sample result qualified	J/UJ MS-L

Evaluation criteria:

Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.3a
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WRBS-3-T01N-PLTU

Analyte	| % D |	Action
Vanadium	16.4	J DL-L

QC limits ± 10 %

Table 1.3b
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WRBS-3-T01N-PLTU

Analyte	| % D |	Action
Aluminum	11.6	J DL-L
Zinc	15.2	
Potassium	27.5	J D - H

QC limits ± 10 %

Table 1.3c
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WRWW-1-T02D-PLTU

Analyte	| % D |	Action
Arsenic	26.8	J DL-L
Molybdenum	60.9	
Silver	14	
Zinc	15.1	

QC limits ± 10 %

Table 1.4
Field Duplicate Pair Results Outside Evaluation Criteria Resulting in Data Qualification for WRRR-1-T02N-PLTU/WRRR-1-T02D-PLTU

Analyte	WRRR-1-T02N-PLTU (mg/kg)	WRRR-1-T02D-PLTU (mg/kg)	RPD (%)	Action
Aluminum	536	1790	108%	J FD-I
Chromium	1.3	4.9	>3.5 x CRDL	
Iron	584	2320	119	
Lead	0.33	5.3	>3.5 x CRDL	
Manganese	27	45.6	51%	
Molybdenum	0.17	3.2	>3.5 x CRDL	
Sodium	166	1830	>3.5 x CRDL	

RPD Criteria ≤50% EQL = Estimation Quantitation Limit

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB05 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 1/7/04

Peer Reviewer: Geoff Webb Date Completed: 01/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
EB05	EB	529797	B	X	X
WRRR-3-T01N-PLTU	SA	529788	B	X	X
WRRR-3-T01N-PLTW	SA	529789	B	X	X
WRRR-3-T02N-PLTU	SA	529790	B	X	X
WRRR-3-T02N-PLTW	SA	529791	B	X	X
WRSG-1-T01N-PLTU[1]	SA	529784	B	X	X
WRSG-1-T01N-PLTW	SA	529785	B	X	X
WRSG-1-T02N-PLTU	SA	529786	B	X	X
WRSG-1-T02N-PLTW	SA	529787	B	X	X
WRWW-2-T01D-PLTU	FD	529793	B	X	X
WRWW-2-T01N-PLTU	SA	529792	B	X	X
WRWW-2-T01N-PLTW	SA	529794	B	X	X
WRWW-2-T02N-PLTU	SA	529795	B	X	X
WRWW-2-T02N-PLTW	SA	529796	B	X	X

Matrix: B = Biota

QC Type: SA = Sample EB = Equipment Blank FD – Field Duplicate

*Modified inorganics list (TKN , % Solids)

[1]Additional sample volume collected and used for matrix QC.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

As mentioned in the laboratory case narrative, the selenium recovery for the LCS was below the established control limits of 75-125% with a recovery of 52% . However, this recovery was above the allowable limit of 50% established by the client (URS) for these samples. Therefore, the selenium results were qualified as estimated (J/UJ) to reflect the potential low bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The TKN analysis for all samples were analyzed seven days outside the holding time requirement of 28 days. Therefore, the TKN results for these samples were qualified as estimated (J) with an indeterminate bias.
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. After accounting for method blank contamination, three target analytes were detected in the equipment blank (EB05). The affected samples, results, and their qualifications from these results are summarized in Table 1.1.
Matrix QC • MS and LD WRSG-1-T01N-PLTU • PDS WRSG-1-T01N-PLTU	No	Several metal results in the MS analysis were outside of the limits in the QAPP. The results and assigned qualification are summarized in Table 1.2. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment for WIS plant samples.
Method QC • Serial Dilution WRSG-1-T01N-PLTU • Internal Standards	Yes	No metal results in the serial dilution analysis were outside of the ± 10% limits in the QAPP. The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples. The internal standard recoveries for several samples were outside the acceptance limits of 30-120%. These results and assigned qualification are summarized in Table 1.3.
Field QC • Field Duplicate WRWW-2-T01N-PLTU/WRWW-2-T01D-PLTU • Rinsate Blank • Field Blank	Yes	All analytes for the field duplicate pairs satisfied the applicable concentration dependent criterion expressed in the QAPP. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	**CRDL –** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum results 182.2% and 191.5% and the iron results 173.8% and 186.2%. Associated aluminum and iron sample results may potentially be biased high for values reported close to the aluminum CRDL concentrations of 20 mg/kg and 10 mg/kg. Sample data have not been qualified on the basis of CRDL standards. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		than the IDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. **LCS –** The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 56%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum	42.7	37.5	35.8	2.796		EB05	U CCB, MB - I
Beryllium		0.6	0.5	-0.022		EB05 WRRR-3-T01N-PLTU WRRR-3-T01N-PLTW WRRR-3-T02N-PLTU WRRR-3-T02N-PLTW WRSG-1-T01N-PLTU WRSG-1-T01N-PLTW WRSG-1-T02N-PLTW WRWW-2-T01D-PLTU WRWW-2-T01N-PLTU WRWW-2-T01N-PLTW WRWW-2-T02N-PLTW	UJ MB-L Or UJ CCB, MB-L Or CCB-I
Lead				0.003		EB05	U MB-I
Sodium				13.785		EB05 WRRR-3-T01N-PLTU WRRR-3-T01N-PLTW WRRR-3-T02N-PLTW WRSG-1-T01N-PLTU WRSG-1-T01N-PLTW WRSG-1-T02N-PLTW WRWW-2-T01N-PLTU WRWW-2-T01N-PLTW WRWW-2-T02N-PLTW	U MB-I
Titanium				0.058		EB05	U MB-I
Chromium	-1.9	-2.5	-1.6			WRRR-3-T01N-PLTW	

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WRSG-1-T01N-PLTU

Analyte	MS %R	PDS %R	Comment	Action
Aluminum	162.6		Parent sample result qualified	J MS-H
Silver	47	74	Parent sample result qualified	J/UJ MS-L
TKN	45.9		Parent sample result qualified	J/UJ MS-L

Evaluation criteria:
Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.3
Internal Standard Recoveries

Sample ID	Tb%R	Sc %R	Comment	Action
WRSG-1-T02N-PLTU	123.2	138.5	Antimony, Cadmium, Cobalt, and Selenium results qualified	J/UJ IS-I
WRWW-2-T02N-PLTU	125.9	147.9	Antimony, Cadmium, Cobalt, and Selenium results qualified	J/UJ IS-I

Internal Standard limits 30-120 %

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB06 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 1/8/04

Peer Reviewer: Geoff Webb Date Completed: 01/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
EB06	EB	530045	B	X	X
WRSD-2-T01N-PLTU	SA	530041	B	X	X
WRSD-2-T01N-PLTW	SA	530042	B	X	X
WRSD-2-T02N-PLTU	SA	530043	B	X	X
WRSD-2-T02N-PLTW	SA	530044	B	X	X
WRWW-1-T01N-PLTU	SA	530029	B	X	X
WRWW-1-T01N-PLTW	SA	530030	B	X	X
WRWW-1-T02N-PLTW	SA	530032	B	X	X
WRWW-1-T02N-PLTU	SA	530031	B	X	X
WTRR-1-T01N-PLTU	SA	530025	B	X	X
WTRR-1-T01N-PLTW	SA	530026	B	X	X
WTRR-1-T02N-PLTU	SA	530027	B	X	X
WTRR-1-T02N-PLTW	SA	530028	B	X	X
WTSD-1-T01N-PLTU	SA	530033	B	X	X
WTSD-1-T01N-PLTW	SA	530034	B	X	X
WTSD-1-T02N-PLTU	SA	530035	B	X	X
WTSD-1-T02N-PLTW	SA	530036	B	X	X
WTSD-3-T01N-PLTU	SA	530037	B	X	X
WTSD-3-T01N-PLTW	SA	530038	B	X	X
WTSD-3-T02N-PLTU	SA	530039	B	X	X
WTSD-3-T02N-PLTW	SA	530040	B	X	X

Matrix: B = Biota

QC Type: SA = Sample EB = Equipment Blank FD = Field Duplicate

*Modified inorganics list (TKN , % Solids)

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

The TKN analysis for the samples in t his delivery group were subcontracted to STL Seattle.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results, and their qualifications from these results are summarized in Table 1.1. After accounting for method blank contamination, one target analyte was detected in the equipment blank (EB06). The affected samples, results, and their qualifications from these results are summarized in Table 1.1.
Matrix QC • MS and LD • PDS	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for WIS plant samples.
Method QC • Serial Dilution WTRR-1-T01N-PLTU • Internal Standards	No	Several metal results in the serial dilution analysis were outside of the ± 10% limits in the QAPP. The results and assigned qualification are summarized in Tables 1.2. The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples. The internal standard recoveries for several samples were outside the acceptance limits of 30-120%. These results and assigned qualification are summarized in Table 1.3.
Field QC • Field Duplicate • Rinsate Blank • Field Blank	NA	This package did not include any field QC samples. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	**CRDL -** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum results 189.6% and 193.6%% and the iron results 189.9% and 201.1%. Associated aluminum and iron sample results may potentially be biased high for values reported close to the aluminum CRDL concentrations of 20 mg/kg and 10 mg/kg. Sample data have not been qualified on the basis of CRDL standards. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the IDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (mg/kg)	EB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum	21	24.3	30.8	1.708		18.3	EB06	U CCB,MB - I
Beryllium				-0.034		0.2	EB06 WRSD-2-T01N-PLTU WTSD-2-T01N-PLTW WRSD-2-T02N-PLTU WRSD-2-T02N-PLTW WRWW-1-T01N-PLTU WRWW-1-T01N-PLTW WRWW-1-T02N-PLTW WTRR-1-T01N-PLTU WTRR-1-T01N-PLTW WTRR-1-T02N-PLTU WTRR-1-T02N-PLTW WTSD-1-T01N-PLTU WTSD-1-T01N-PLTW WTSD-1-T02N-PLTW WTSD-3-T01N-PLTU WTSD-3-T01N-PLTW WTSD-3-T02N-PLTW	J/UJ MB-L
Chromium	-2.8	-2.4	-2.0	-0.076		0.6	EB06	J CCB,MB-L
Iron		19.1	39.5	1.172		16.8	EB06	U CCB,MB - I
Selenium			1.8	0.105		1.7	EB06 WTRR-1-T01N-PLTU WTRR-1-T02N-PLTW WTSD-1-T01N-PLTW WTSD-3-T01N-PLTU	U CCB,MB – I OR MB-I
Titanium				0.037		0.7	EB06	U MB-I
Sodium					20.6	218.8	WRSD-2-T01N-PLTU WTSD-2-T01N-PLTW WRSD-2-T02N-PLTW WRWW-1-T01N-PLTU WTRR-1-T02N-PLTU WTRR-1-T02N-PLTW WTSD-1-T01N-PLTU WTSD-1-T01N-PLTW WTSD-1-T02N-PLTU WTSD-3-T01N-PLTU WTSD-3-T01N-PLTW WTSD-3-T02N-PLTW	U EB-I
Molybdenum	2.4	1.7	1.9			1.6	WRWW-1-T01N-PLTW WRWW-1-T02N-PLTW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WTRR-1-T01N-PLTU

Analyte	| % D |	Action
Aluminum	12.8	J DL-L
Cadmium	16.4	

QC limits ± 10 %

Table 1.3
Internal Standard Recoveries

Sample ID	Sc %R	Comment	Action
WTSD-3-T02N-PLTU	144.6	Cobalt and Selenium results qualified	J/UJ IS-I

Internal Standard limits 30-120 %

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB07 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Sheri O'Connor Date Completed: 1/9/04

Peer Reviewer: Geoff Webb Date Completed: 01/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
EB07	EB	530182	B	X	X
WTCW-1-T01N-PLTU	SA	530178	B	X	X
WTCW-1-T01N-PLTW	SA	530179	B	X	X
WTCW-1-T02N-PLTU	SA	530180	B	X	X
WTCW-1-T02N-PLTW	SA	530181	B	X	X
WTCW-2-T01N-PLTU	SA	530162	B	X	X
WTCW-2-T01N-PLTW	SA	530163	B	X	X
WTCW-2-T02N-PLTU	SA	530164	B	X	X
WTCW-2-T02N-PLTW	SA	530165	B	X	X
WTRR-2-T01N-PLTU	SA	530166	B	X	X
WTRR-2-T01N-PLTW	SA	530167	B	X	X
WTRR-2-T02N-PLTU	SA	530168	B	X	X
WTRR-2-T02N-PLTW	SA	530169	B	X	X
WTSG-3-T01N-PLTU	SA	530170	B	X	X
WTSG-3-T01N-PLTW	SA	530171	B	X	X
WTSG-3-T02N-PLTU	SA	530172	B	X	X
WTSG-3-T02N-PLTW	SA	530173	B	X	X
WTWW-3-T01N-PLTU	SA	530174	B	X	X
WTWW-3-T01N-PLTW	SA	530175	B	X	X
WTWW-3-T02N-PLTU	SA	530176	B	X	X
WTWW-3-T02N-PLTW	SA	530177	B	X	X

Matrix: B = Biota

QC Type: SA = Sample EB = Equipment Blank FD = Field Duplicate

*Modified inorganics list (TKN , % Solids)

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

As mentioned in the laboratory case narrative, the selenium recovery for the LCS was below the established control limits of 75-125% with a recovery of 52%. However, this recovery was above the allowable limit of 50% established by the client (URS) for these samples. Therefore, the selenium results were qualified as estimated (J/UJ) to reflect the potential low bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The TKN analysis for all samples were analyzed 7-14 days outside the holding time requirement of 28 days. Therefore, the TKN results for these samples were qualified as estimated (J) with an indeterminate bias.
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affected samples, results, and their qualifications from these results are summarized in Table 1.1. After accounting for method blank contamination, two target analytes (zinc and TKN) were detected in the equipment blank (EB07). The affected samples, results, and their qualifications from these results are summarized in Table 1.1. TKN carryover from the laboratory preparation equipment resulted in qualification of all samples as estimated (J EB-H). Qualification as nondetect was not considered appropriate, as TKN is inherent to plants.
Matrix QC • MS and LD • PDS	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for WIS plant samples.
Method QC • Serial Dilution WTCW-2-T01N-PLTU • Internal Standards	No	One metal result in the serial dilution analysis was outside of the ± 10% limits in the QAPP. The results and assigned qualification are summarized in Tables 1.2. The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples. The internal standard recoveries for several samples were outside the acceptance limits of 30-120%. These results and assigned qualification are summarized in Table 1.3.
Field QC • Field Duplicate • Rinsate Blank • Field Blank	NA	No field QC samples were analyzed with this data package. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	No	The nickel CCV associated with seven samples was below the lower limit of the acceptance range 90-110% with a recovery of 88.1%. Therefore, the nickel results for samples WTWW-3-T02N-PLTU, WTWW-3-T02N-PLTW, WTCW-1-T0-1N-PLTU, WTCW-1-T02N-PLU, WTCW-1-T0N-PLTW, and EB07 were qualified as estimated (J/UJ) to reflect the potential low bias.
Laboratory Control Sample Results	No	The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 52%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias.
Compound Identification	Yes	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	**ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	**CRDL –** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum results 164.7%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum CRDL concentrations of 20 mg/kg. Sample data have not been qualified on the basis of CRDL standards.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (mg/kg)	EB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum		-40.8	-43.3	-41.2			18.3	EB07	J/UJ CCB-L
Arsenic		-5.3					2.4	EB07 WTCW-1-T01N-PLTU WTCW-1-T01N-PLTW WTCW-2-T01N-PLTU WTCW-2-T01N-PLTW WTCW-2-T02N-PLTW WTRR-2-T01N-PLTU WTRR-2-T01N-PLTW WTRR-2-T02N-PLTU WTRR-2-T02N-PLTW WTSG-3-T01N-PLTU WTSG-3-T01N-PLTW WTSG-3-T02N-PLTW	J/UJ CCB-L

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (mg/kg)	EB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
								WTWW-3-T01N-PLTU WTWW-3-T01N-PLTW WTWW-3-T02N-PLTW	
Chromium (P)	-2.0	-2.0	-2.0	-1.8	0.063		0.6	EB07 WTCW-1-T01N-PLTU WTCW-1-T01N-PLTW WTCW-2-T01N-PLTW WTRR-2-T01N-PLTW WTSG-3-T01N-PLTU WTSG-3-T01N-PLTW WTWW-3-T01N-PLTU	J/UJ CCB-L OR UJ MB,CCB-L
Copper	-3.9	-4.1	-4.3	-3.9			1.4	EB07	J/UJ CCB-L
Iron	-78.1	-82.7	-76.9	-78.3			16.8	EB07	J/UJ CCB-L
Sodium	-839.6	-884.8	-911.2	-957.7	14.865		218.8	EB07 WTCW-1-T01N-PLTU WTCW-1-T01N-PLTW WTCW-1-T02N-PLTU WTCW-1-T02N-PLTW WTCW-2-T01N-PLTU WTCW-2-T01N-PLTW WTCW-2-T02N-PLTW WTCW-2-T02N-PLTU WTRR-2-T01N-PLTU WTRR-2-T01N-PLTW WTRR-2-T02N-PLTU WTRR-2-T02N-PLTW WTSG-3-T01N-PLTU WTSG-3-T01N-PLTW WTSG-3-T02N-PLTU WTSG-3-T02N-PLTU WTWW-3-T01N-PLTU WTWW-3-T01N-PLTW WTWW-3-T02N-PLTU WTWW-3-T02N-PLTW	J/UJ CCB-L Or UJ MB,CCB-L
Lead (MS)					0.030		0.10	EB07	U MB-I
Titanium					0.042		0.7	EB07	U MB-I
Antimony	0.9	1.0	1.0				0.5	WTCW-2-T02N-PLTW WTCW-2-T02N-PLTU WTRR-2-T01N-PLTU WTRR-2-T02N-PLTU WTSG-3-T02N-PLTU WTSG-3-T02N-PLTW WTWW-3-T02N-PLTU WTWW-3-T02N-PLTW	U CCB-I
TKN						129	47.1	All samples	J EB-H
Nickel (MS)					0.030		0.6	WTWW-3-T01N-PLTW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WTCW-2-T01N-PLTU

Analyte	| % D |	Action
Potassium	35.1	J DL-L

QC limits ± 10 %

Table 1.3
Internal Standard Recoveries

Sample ID	Tb %R	Sc %R	Comment	Action
WTCW-2-T02N-PLTU	133.3	148.4	Cobalt, Selenium, Cadmium, and antimony results qualified	J/UJ IS-I

Internal Standard limits 30-120 %

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB08 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 12/29/03

Peer Reviewer: Geoff Webb Date Completed: 01/09/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
WTSD-2-T01N-PLTU	SA	530214	B	X	X
WTSD-2-T01N-PLTW	SA	530215	B	X	X
WTSD-2-T02N-PLTU	SA	530216	B	X	X
WTSD-2-T02N-PLTW	SA	530217	B	X	X
WTBS-1-T01N-PLTU	SA	530218	B	X	X
WTBS-1-T01N-PLTW	SA	530219	B	X	X
WTBS-1-T02N-PLTU	SA	530220	B	X	X
WTBS-1-T02N-PLTW	SA	530221	B	X	X
EB08	EB	530222	B	X	X
WRBS-1-T01N-PLTU	SA	530404	B	X	X
WRBS-1-T01N-PLTW	SA	530405	B	X	X
WRBS-1-T02N-PLTU	SA	530406	B	X	X
WRBS-1-T02N-PLTW	SA	530407	B	X	X
WRCW-3-T01N-PLTU	SA	530408	B	X	X
WRCW-3-T01N-PLTW	SA	530409	B	X	X
WRCW-3-T02N-PLTU	SA	530410	B	X	X
WRCW-3-T02N-PLTW	SA	530411	B	X	X
WRRR-2-T01N-PLTU	SA	530412	B	X	X
WRRR-2-T01N-PLTW	SA	530413	B	X	X
WRRR-2-T02N-PLTU	SA	530414	B	X	X
WRRR-2-T02N-PLTW	SA	530415	B	X	X

Matrix: B = Biota
QC Type: SA = Sample EB = Equipment Blank
*Modified inorganics list (TKN , % Solids)

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank (EB) from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentrations <5x the method blank were qualified as nondetect (U). Samples were then qualified based on any remaining detects, as summarized in Table 1.2.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

As mentioned in the laboratory case narrative, the laboratory control sample (LCS) selenium recovery of 60.0% was below the established control limits of 75-125%. However, this recovery was above the allowable limit of 50% established by the client (URS) for these samples and was accordingly reported. The laboratory noted this low recovery was related to interference from the high concentration of nitric acid in the digestates. Due to the potential low bias in the reporting of selenium results on the basis of low LCS recovery, all selenium results were qualified as estimated (J/UJ).

The laboratory case narrative states the metals analysis of the initial calibration verification resulted in a 89.4% recovery for lead. As this percent recovery was marginally below the acceptance range of 90-110%, no qualification of data was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As mentioned in the laboratory case narrative, the TKN analyses of the samples in this delivery group were accomplished 8-18 days beyond the prescribed analytical holding time of 28 days. The laboratory noted the delays were related to a laboratory accident which prevented entry into the TKN laboratory. Accordingly, all TKN results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. Results were qualified as nondetect on the basis of continuing calibration blank (CCB)/method blank, or estimated (UJ) due to a negative CCB detection, as summarized in Table 1.2. The majority of the zinc results were qualified as nondetect at the concentration reported on the basis of equipment blank detections, as summarized in Table 1.2.
Matrix QC • MS/D • LD • PDS	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for WIS plant samples.
Method QC • Serial Dilution WTSD-2-T01N-PLTU WTSD-2-T01N-PLTW • Internal Standards	No	The serial dilution analyses conducted on samples WTSD-2-T01N-PLTU (P) and WTSD-2-T01N-PLTW (MS) were not applicable for 16 of the 25 metal analytes, as only nine exhibited initial concentrations in excess of 50 times the IDL. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. As none of the % Ds for the applicable metals were in excess of 10%, no qualification on the basis of serial dilution was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples. The internal standard recoveries of ^{45}Sc, ^{89}Y, and ^{159}Tb were out for the ICPMS analyses of multiple samples in this delivery group. Table 1.3 summarizes the samples exhibiting internal standard recoveries outside the established acceptance range of the method for which qualification was necessary. For the others, the associated analyte was reported from the ICP rather than the ICPMS or was reprocessed using a different internal standard. The reporting limits met the requirement of the QAPP, such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate • Rinsate Blank • Field Blank	Yes	No field QC samples were analyzed with this data package. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • **Metals:** Interference Check Sample Results Results for several analytes not present ion the ICS standard solution were reported with absolute values greater than the IDL. However, sample WRCW-3-T02N-PLTU contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. The results and assigned qualification are summarized in Table 1.3. • **Metals:** Contract Required Detection Limit The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, therefore no qualification of data was necessary on the basis of CRDL recoveries. • **Metals:** Continuing Calibration Verification The CCV2 for selenium was recovered below the acceptance range of 90-110% with a recovery of 85.0%. Accordingly, the samples associated with this calibration event were qualified as estimated (J/UJ) to reflect the potential low bias of reported selenium results. In addition, CCV2 for potassium was marginally recovered below the lower limit of 90%, with a recovery of 89.5%. Due to the fact that this recovery rounds to 90%, no qualification of potassium results on the basis of continuing calibration verification results was considered necessary. • **Metals:** Laboratory Control Sample The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 60%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias.

Table 1.1
Holding Time Qualifications for Inorganics

Analysis	Samples Qualified	QAPP Requirement	Time Beyond Holding Time Limit	Qualification
TKN	All TKN results	28 days	8-18 days	J/UJ HT-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	EB (mg/kg)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P)	---	-27.1	-25.9	-37.0	---	---	---	23.6	EB08	UJ CCB-L
Antimony (MS)	0.6	1.1	1.2	5.7	1.9	---	-0.011	0.50	WTSD-2-T01N-PLTW WTSD-2-T02N-PLTU	U CCB-I
									All samples	UJ MB-L
Beryllium (P)	---	---	0.2	---	---	---	---	0.2	WRBS-1-T01N-PLTU WRBS-1-T01N-PLTW WRBS-1-T02N-PLTW WRCW-3-T01N-PLTU WRCW-3-T01N-PLTW WRCW-3-T02N-PLTU WRRR-2-T01N-PLTU WRRR-2-T02N-PLTW	U CCB-I
Lead (MS)	---					---	0.01	0.10	EB08	U MB-I
Molybdenum (P)	1.8	---	---	---	---	---	0.107	1.7	WRBS-1-T01N-PLTU WRBS-1-T01N-PLTW WRBS-1-T02N-PLTU WRBS-1-T02N-PLTW WRCW-3-T01N-PLTU WRCW-3-T01N-PLTW WRCW-3-T02N-PLTU WRCW-3-T02N-PLTU WRRR-2-T01N-PLTU WRRR-2-T01N-PLTW WRRR-2-T02N-PLTU WRRR-2-T02N-PLTW	U MB-I
Nickel (MS)	-0.6	-0.6	-0.7	-0.6	-0.6	---	---	0.6	EB08	UJ CCB-L
Sodium (P)	---	---	---	---	---	---	50.5	472.7	EB08 WRBS-1-T01N-PLTU WRBS-1-T01N-PLTW WRBS-1-T02N-PLTU WRBS-1-T02N-PLTW WRCW-3-T01N-PLTU WRCW-3-T01N-PLTW WRCW-3-T02N-PLTU WRCW-3-T02N-PLTU WRRR-2-T01N-PLTW WRRR-2-T01N-PLTU WRRR-2-T02N-PLTW WTBS-1-T01N-PLTU WTBS-1-T01N-PLTW WTSD-2-T01N-PLTU WTSD-2-T01N-PLTW WTSD-2-T01N-PLTU WTSD-2-T02N-PLTW	U MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	EB (mg/kg)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Zinc (P)	---	---	---	---	---	3.3	---	---	WRBS-1-T01N-PLTU WRBS-1-T01N-PLTW WRBS-1-T02N-PLTU WRCW-3-T01N-PLTW WRCW-3-T02N-PLTU WRRR-2-T01N-PLTW WRRR-2-T01N-PLTU WRRR-2-T02N-PLTW WTBS-1-T02N-PLTU	U EB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit EB = Equipment Blank U = Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Internal Standard Recoveries Resulting in Sample Qualifications

Analyte	IS	IS %R	Samples Qualified	Qualification Codes
Antimony	159Tb	123-140	WRCW-3-T02N-PLTU WTSD-2-T02N-PLTU	J IS-I
Cadmium				
Selenium	45Sc	121-171	WRCW-3-T02N-PLTW WRRR-2-T02N-PLTU WTSD-2-T02N-PLTU	

Table 1.4
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Antimony	2.0	0.5	WRCW-3-T02N-PLTU	J ICS-H
Arsenic	7	4.8		
Zinc	4	1		

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB09 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 12/29/03

Peer Reviewer: Geoff Webb Date Completed: 01/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
WRCW-2-T01N-PLTU	SA	530425	B	X	X
WRCW-2-T01N-PLTW	SA	530426	B	X	X
WRCW-2-T02N-PLTU	SA	530427	B	X	X
WRCW-2-T02N-PLTW	SA	530428	B	X	X
WTWW-1-T01N-PLTU	SA	530429	B	X	X
WTWW-1-T01N-PLTW	SA	530430	B	X	X
WTWW-1-T02N-PLTU	SA	530431	B	X	X
WTWW-1-T02N-PLTW	SA	530432	B	X	X
WRCW-1-T01N-PLTU	SA	530433	B	X	X
WRCW-1-T01N-PLTW	SA	530434	B	X	X
WRCW-1-T02N-PLTU	SA	530435	B	X	X
WRCW-1-T02N-PLTW	SA	530436	B	X	X
EB09	EB	530437	B	X	X

Matrix: B = Biota
QC Type: SA = Sample EB = Equipment Blank
*Modified inorganics list (TKN , % Solids)

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank (EB) from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentrations <5x the method blank were qualified as nondetect (U). After accounting for the method blank contamination, no analytes were present in the equipment blank, therefore no data qualification was necessary.

All sample results were reported on a “wet weight” basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to “dry weight” basis results if desired.

As mentioned in the laboratory case narrative, the selenium recovery of 72.0% was below the established control limits of 75-125%. However, this recovery was above the allowable limit of 50% established by the client (URS) for these samples and was accordingly reported. The laboratory noted this low recovery was related to interference from the high concentration of nitric acid in the digestates. Due to the potential low bias in the reporting of selenium results on the basis of low LCS recovery, all selenium results were qualified as estimated (J/UJ).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As mentioned in the laboratory case narrative, the TKN analyses of the samples in this delivery group were accomplished 7-19 days beyond the prescribed analytical holding time of 28 days. The laboratory noted the delays were related to a laboratory accident which prevented entry into the TKN laboratory. Accordingly, all TKN results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. However, several beryllium, chromium, lead, mercury, nickel, sodium, titanium, and zinc results were qualified as nondetect on the basis of continuing calibration blank (CCB), or estimated (UJ) due to a negative CCB detection, as summarized in Table 1.2. TKN carryover from the laboratory preparation equipment resulted in qualification of several samples as estimated (J EB-H). Qualification as nondetect was not considered appropriate, as TKN is inherent to plants
Matrix QC • MS/D • LD • PDS	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for WIS plant samples.
Method QC • Serial Dilution WRCW-2-T01N-PLTU • Internal Standards	No	The serial dilution analysis conducted on sample WRCW-2-T01N-PLTU was not applicable for 18 of the 25 metal analytes, as only seven exhibited initial concentrations in excess of 50 times the IDL. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. As none of the % Ds for the applicable metals were in excess of 10%, no qualification on the basis of serial dilution was necessary. The internal standard recoveries of ^{45}Sc, ^{89}Y, and ^{159}Tb were out for the ICPMS analyses of multiple samples in this delivery group. Table 1.3 summarizes the samples exhibiting internal standard recoveries outside the established acceptance range of the method for which qualification was necessary. For the others, the associated analyte was reported from the ICP rather than the ICPMS or was reprocessed using a different internal standard. The reporting limits met the requirement of the QAPP, such that the change in instrumentation did not affect the usability of the data. For the analytes which were reported from the trace ICP, the reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank • Field Blank	Yes	No field QC samples were analyzed with this data package. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • **Metals:** Interference Check Sample Results One sample (WTWW-1-T02N-PLTU) contained the interferent element iron in a high enough quantity to necessitate an examination of potential biases incurred on sample results due to interferences. No qualification of this sample necessary as all analytes pertinent to the study were contained in the sample at concentrations greater than the criteria numbers. • **Metals:** Contract Required Detection Limit The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. Aluminum reported a 179.4 % recovery, outside the criteria range of 50-150%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum CRDL concentration of 20 mg/kg. Sample results for aluminum were not qualified on the basis of CRDL standards. • **Metals:** Continuing Calibration Verification All CCV recoveries were reported within the acceptance range of 90-110%. Accordingly, no qualification of data was necessary on the basis of CCV results. • **Metals:** Laboratory Control Sample The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 72%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias.

Table 1.1
Holding Time Qualifications for Inorganics

Analysis	Samples Qualified	QAPP Requirement	Time Beyond Holding Time Limit	Qualification
TKN	All TKN results	28 days	8-18 days	J/UJ HT-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	EB (mg/kg)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Beryllium (P)	0.3	0.4	0.5	---	---		EB08 WRCW-1-T01N-PLTU WRCW-1-T02N-PLTW WRCW-2-T01N-PLTU WRCW-2-T02N-PLTW WTWW-1-T01N-PLTU WTWW-1-T02N-PLTW	U CCB-I U MB,CCB-I U MB-I
Chromium (P)	-0.7	-0.7	---	---	---		EB09	UJ CCB-I
Lead (MS)	---	---	---	---	0.01		EB09 WRCW-1-T01N-PLTW WRCW-2-T01N-PLTW	U MB-1
Mercury (CV)	---	---	----	---	0.029		WRCW-1-T01N-PLTU WRCW-2-T02N-PLTU WTWW-1-T02N-PLTU	U MB-I
Nickel (MS)	---	---	---	---	-0.172		EB09 WRCW-1-T01N-PLTU WRCW-1-T01N-PLTW WRCW-1-T02N-PLTU WRCW-2-T01N-PLTU WRCW-2-T01N-PLTW WTWW-1-T01N-PLTU WTWW-1-T01N-PLTW	UJ MB-L
Sodium (P)	333.5	289.6	254.8	---	29.29		EB09 WRCW-1-T01N-PLTU WRCW-1-T01N-PLTW WRCW-1-T02N-PLTW WRCW-2-T01N-PLTU WRCW-2-T01N-PLTW WRCW-2-T02N-PLTW WTWW-1-T01N-PLTU WTWW-1-T01N-PLTW WTWW-1-T02N-PLTW	U MB,CCB-I U MB-I
Titanium (P)	---	---	---	---	0.044		EB09	U MB-I
Zinc (P)	---	---	---	---	0.328		EB09	U MB-I
TKN	---	---	---	48.6	---	48.0	WRCW-2-T02N-PLTU WTWW-1-T02N-PLTU WRCW-1-T01N-PLTU WRCW-1-T01N-PLTW WRCW-1-T02N-PLTU WRCW-1-T02N-PLTW	J EB-H

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit EB = Equipment Blank

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Internal Standard Recoveries Resulting in Sample Qualifications

Analyte	IS	IS %R	Samples Qualified	Qualification Codes
Antimony	^{159}Tb	122-126	WRCW-2-T02N-PLTU WRCW-1-T02N-PLTU	UJ IS-I
Cadmium				
Selenium	^{45}Sc	122-151	WRCW-2-T02N-PLTU WTWW-1-T02N-PLTU WRCW-1-T02N-PLTU	J IS-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB10 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 12/30/03

Peer Reviewer: Geoff Webb Date Completed: 01/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
WTBG-2-T02N-PLTU	SA	540893	B	X	X
WTBG-2-T02N-PLTW	SA	540894	B	X	X
WTBG-2-T01N-PLTU	SA	540895	B	X	X
WTBG-2-T01N-PLTW	SA	540896	B	X	X
WRBG-3-T01N-PLTU	SA	540897	B	X	X
WRBG-3-T01N-PLTW	SA	540898	B	X	X
WRBG-3-T02N-PLTU	SA	540899	B	X	X
WRBG-3-T02N-PLTW	SA	540900	B	X	X
WRBG-1-T01N-PLTU	SA	540901	B	X	X
WRBG-1-T01N-PLTW	SA	540902	B	X	X
WRBG-1-T02N-PLTU	SA	540903	B	X	X
WRBG-1-T02N-PLTW	SA	540904	B	X	X
WRSD-1R-T01N-PLTU	SA	540905	B	X	X
WRSD-1R-T01D-PLTU	FD	540906	B	X	X
WRSD-1R-T01N-PLTW	SA	540907	B	X	X
WRSD-1R-T02N-PLTU	SA	540908	B	X	X
WRSD-1R-T02N-PLTW	SA	540909	B	X	X
WRBG-4-T01N-PLTU	SA	540910	B	X	X
WRBG-4-T01N-PLTW	SA	540911	B	X	X
EB10	EB	540912	B	X	X

Matrix: B = Biota
QC Type: SA = Sample EB = Equipment Blank
*Modified inorganics list (TKN , % Solids)

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank (EB) from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentrations <5x the method blank were qualified as

nondetect (U). After accounting for the method blank contamination, no analytes were present in the equipment blank, therefore no data qualification was necessary.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

As mentioned in the laboratory case narrative, the selenium recovery of 56.0% was below the established control limits of 75-125%. However, this recovery was above the allowable limit of 50% established by the client (URS) for these samples and was accordingly reported. The laboratory noted this low recovery was related to interference from the high concentration of nitric acid in the digestates. Due to the potential low bias in the reporting of selenium results on the basis of low LCS recovery, all selenium results were qualified as estimated (J/UJ).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. However, several antimony, chromium, potassium, sodium, and titanium results were qualified as nondetect on the basis of continuing calibration blank (CCB), or estimated (UJ) due to a negative CCB detection, as summarized in Table 1.1. After accounting for method blank contamination, no analytes were present in the equipment blank. Therefore, no data qualification was necessary on the basis of equipment blank contamination.
Matrix QC • MS/D • LD • PDS	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for WIS plant samples.
Method QC • Serial Dilution WTBG-2-T02N-PLTU • Internal Standards	No	The serial dilution analysis conducted on sample WTBG-2-T02N-PLTU was not applicable for eight of the 25 metal analytes, as 17 exhibited initial concentrations in excess of 50 times the IDL. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. Table 1.2 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The internal standard recoveries of ^{45}Sc, ^{89}Y, ^{115}In, ^{209}Bi, and ^{6}Li were out for the ICPMS analyses of multiple samples in this delivery group. Table 1.3 summarizes the samples exhibiting internal standard recoveries outside the established acceptance range of the method for which qualification was necessary. For the others, the associated analyte was reported from the ICP rather than the ICPMS or was reprocessed using a different internal standard. The reporting limits met the requirement of the QAPP, such that the change in instrumentation did not affect the usability of the data. The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate WRSD-1R-T01N/T01D-PLTU • Rinsate Blank • Field Blank	Yes	The field duplicate agreement analysis satisfied the evaluative criteria put forth in the QAPP. As such, no data qualification was necessary on the basis of field duplicate results. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • **Metals:** Interference Check Sample Results Several sample results were qualified on the basis of biases suggested by the ICS A analyses. Table 1.4 summarizes the analytes and samples for which qualification was necessary. • **Metals:** Contract Required Detection Limit The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. Aluminum reported a 146.7 % recovery, outside the criteria range of 50-150%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum CRDL concentration of 20 mg/kg. Sample results for aluminum were not qualified on the basis of CRDL standards. • **Metals:** Continuing Calibration Verification All CCV recoveries were reported within the acceptance range of 90-110%. Accordingly, no qualification of data was necessary on the basis of CCV results. • **Metals:** Laboratory Control Sample The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 56.0%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	EB (mg/kg)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (MS)	0.9	0.7	0.8	0.8	---	0.018	0.50	WRBG-1-T02N-PLTU WRBG-1-T02N-PLTW WRBG-3-T02N-PLTU WRBG-3-T02N-PLTW WRSD-1R-T02N-PLTU WRSD-1R-T02N-PLTW WTBG-2-T01N-PLTU WTBG-2-T02N-PLTU WTBG-2-T02N-PLTW	U MB,CCB-I
Chromium (P)	---	---	---	---	---	0.38	1.1	WRBG-1-T01N-PLTU WRBG-1-T01N-PLTW WRBG-3-T01N-PLTW WRBG-4-T01N-PLTU WRBG-4-T01N-PLTW WRSD-1R-T01N-PLTW WRSD-1R-T02N-PLTW	U MB-I
Potassium (P)	---	---	-523.3	---	---	---	318.0	EB10	UJ CCB-L

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	EB (mg/kg)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Sodium (P)	---	---	---	---	---	37.14	453.8	EB10 WRBG-1-T01N-PLTU WRBG-1-T01N-PLTW WRBG-1-T02N-PLTU WRBG-3-T01N-PLTU WRBG-3-T01N-PLTW WRBG-3-T02N-PLTW WRBG-4-T01N-PLTU WRBG-4-T01N-PLTW WRSD-1R-T01D-PLTU WRSD-1R-T01N-PLTU WRSD-1R-T01N-PLTW WRSD-1R-T02N-PLTW WTBG-2-T01N-PLTU WTBG-2-T01N-PLTW WTBG-2-T02N-PLTU WTBG-2-T02N-PLTW	U MB-I
Titanium (P)	---	---	---	---	---	0.11	1.4	EB10	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit EB = Equipment Blank

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
WTBG-2-T02N-PLTU		
Aluminum	13.9	J DL-L
Barium	12.7	
Cobalt	111.0	
Chromium	16.1	
Iron	17.8	
Lead	18.3	
Magnesium	14.2	
Nickel	27.9	
Manganese	17.6	
Molybdenum	15.0	
Thallium	12.8	
Potassium	23.7	
Vanadium	15.8	
Zinc	21.3	

Table 1.3
Internal Standard Recoveries Resulting in Sample Qualifications

Analyte	IS	IS %R	Samples Qualified	Qualification Codes
Lead	^{209}Bi	55.4	WRSD-1R-T02N-PLTU	J IS-I
Nickel	^{115}In	58.7	WTBG-2-T02N-PLTU	
Thallium	^{209}Bi	55.4	WRSD-1R-T02N-PLTU	
Selenium	^{45}Sc	121-154	WTBG-2-T02N-PLTU WTBG-2-T02N-PLTW WRSD-1R-T01N-PLTW	UJ IS-I
Vanadium	^{45}Sc	121-154	WRBG-3-T02N-PLTW WRSD-1R-T02N-PLTW EB10	J IS-I

Table 1.4
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Antimony	2.0	0.5	WRBG-3-T02N-PLTU WRSD-1R-T02N-PLTU WTBG-2-T02N-PLTU	J ICS-H
Arsenic	6	4.1	WRBG-3-T02N-PLTU WRSD-1R-T02N-PLTU WTBG-2-T02N-PLTW	J ICS-H
Boron	-69	6.3	WRBG-3-T02N-PLTU WRSD-1R-T02N-PLTU WTBG-2-T02N-PLTU WTBG-2-T02N-PLTW	J ICS-L
Molybdenum	-3	1.1	WRBG-3-T02N-PLTU WRSD-1R-T02N-PLTU	J ICS-L
Selenium	1	0.3	WRSD-1R-T02N-PLTU WTBG-2-T02N-PLTU	J ICS-H UJ ICS-H

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB11 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 12/31/03

Peer Reviewer: Geoff Webb Date Completed: 01/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
WRBG-4-T02N-PLTU	SA	540913	B	X	X
WRBG-4-T02N-PLTW	SA	540914	B	X	X
WTBG-1-T01N-PLTW	SA	540915	B	X	X
WTBG-1-T01D-PLTW	FD	540916	B	X	X
WTBG-1-T01N-PLTU	SA	540917	B	X	X
WTBG-1-T02N-PLTU	SA	540918	B	X	X
WTBG-1-T02N-PLTW	SA	540919	B	X	X
EB11	EB	540920	B	X	X
WTFO-1-T01N-PLTW	SA	540921	B	X	X
WTFO-1-T02N-PLTW	SA	540922	B	X	X
WTFO-3-T01N-PLTW	SA	540923	B	X	X
WTFO-3-T02N-PLTW	SA	540924	B	X	X
WTAS-2-T01N-PLTW	SA	540925	B	X	X
WTAS-2-T02N-PLTW	SA	540926	B	X	X
WTFO-2-T01N-PLTW	SA	540927	B	X	X
WTFO-2-T02N-PLTW	SA	540928	B	X	X
WTAS-3-T01N-PLTW	SA	540929	B	X	X
WTAS-3-T02N-PLTW	SA	540930	B	X	X
WTAS-1-T01N-PLTW	SA	540931	B	X	X
WTAS-1-T02N-PLTW	SA	540932	B	X	X

Matrix: B = Biota

QC Type: SA = Sample EB = Equipment Blank

*Modified inorganics list (TKN , % Solids)

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank (EB) from the equipment used for homogenizing the tissue samples. As there were no analytes detected in the EB sample, no data qualification on the basis of equipment blank contamination was necessary.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

The laboratory case narrative noted that due to a limited volume available for sample WTAS-1-T02N-PLTW, the ICPMS digestate was analyzed on the Trace ICP. It is noted that the associated preparation blank (PBS0923E) yielded responses above the reporting limit for aluminum, calcium, iron, manganese, and titanium. There was inadequate amount of this sample to provide a second digestion. This did not affect the quality or the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. However, several aluminum, antimony, arsenic, chromium, iron, and titanium results were qualified as nondetect on the basis of method blank (MB) or continuing calibration blank (CCB), or estimated (J/UJ) due to a negative MB detection, as summarized in Table 1.1. After accounting for method blank contamination, no analytes were present in the equipment blank. Therefore, no data qualification was necessary on the basis of equipment blank contamination.
Matrix QC • MS/D • LD • PDS	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for WIS plant samples.
Method QC • Serial Dilution WRBG-4-T02N-PLTU • Internal Standards	No	The serial dilution analysis conducted on sample WRBG-4-T02N-PLTU was not applicable for ten of the 25 metal analytes, as 15 exhibited initial concentrations in excess of 50 times the IDL. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. Table 1.2 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The internal standard recoveries of ^{45}Sc, ^{89}Y, ^{115}In, ^{209}Bi, and ^{6}Li were out for the ICPMS analyses of multiple samples in this delivery group. Table 1.3 summarizes the samples exhibiting internal standard recoveries outside the established acceptance range of the method for which qualification was necessary. For the others, the associated analyte was reported from the ICP rather than the ICPMS or was reprocessed using a different internal standard. The reporting limits met the requirement of the QAPP, such that the change in instrumentation did not affect the usability of the data. The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate WTBG-1-T01N/T01D-PLTW • Rinsate Blank • Field Blank	Yes	The field duplicate agreement analysis satisfied the evaluative criteria put forth in the QAPP. As such, no data qualification was necessary on the basis of field duplicate results. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • **Metals:** Interference Check Sample Results Several sample results were qualified on the basis of biases suggested by the ICS A analyses. Table 1.4 summarizes the analytes and samples for which qualification was necessary. • **Metals:** Contract Required Detection Limit The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria range, with the exception of aluminum and iron, which reported 182.5% and 172.4%, respectively. Associated aluminum and iron sample results may potentially be biased high. Sample results for aluminum or iron were not qualified on the basis of CRDL standards. • **Metals:** Continuing Calibration Verification All CCV recoveries were reported within the acceptance range of 90-110%. Accordingly, no qualification of data was necessary on the basis of CCV results. • **Metals:** Laboratory Control Sample The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 60.0%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P)	33.5	40.8	---	---	39.02	30.7	WTAS-3-T01N-PLTW	U MB-I
Antimony (MS)	0.9	0.8	0.8	0.8	---	0.50	WRBG-4-T02N-PLTU WRBG-4-T02N-PLTW WTBG-1-T01N-PLTU WTBG-1-T02N-PLTU WTBG-1-T02N-PLTW	U CCB-I
Arsenic (MS)	---	---	---	---	-0.19	3.5	EB11 WRBG-4-T02N-PLTU WRBG-4-T02N-PLTW WTAS-1-T01N-PLTW WTAS-2-T01N-PLTW WTAS-2-T02N-PLTW WTAS-3-T02N-PLTW	UJ MB-L J MB-L

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
							WTBG-1-T01D-PLTW WTBG-1-T01N-PLTU WTBG-1-T01N-PLTW WTBG-1-T02N-PLTW WTFO-1-T01N-PLTW WTFO-1-T02N-PLTW WTFO-2-T01N-PLTW WTFO-2-T02N-PLTW WTFO-3-T01N-PLTW WTFO-3-T02N-PLTW	
Chromium (P)	---	---	---	---	0.057	1.3	WTAS-3-T01N-PLTW	U MB-I
Iron (P)	---	---	---	---	32.1	2.8	WTAS-3-T01N-PLTW	U MB-I
Titanium (P)	---	---	----	---	1.25	1.4	WTAS-3-T01N-PLTW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit EB = Equipment Blank

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
WRBG-4-T02N-PLTU		
Aluminum	16.5	J DL-L
Arsenic	33.9	
Barium	13.5	
Calcium	17.0	
Chromium	14.2	
Cobalt	84.6	
Copper	12.5	
Iron	15.2	
Magnesium	15.8	
Manganese	15.9	
Nickel	18.1	
Potassium	30.2	
Titanium	14.6	
Vanadium	14.2	
Zinc	18.9	

Table 1.3
Internal Standard Recoveries Resulting in Sample Qualifications

Analyte	IS	IS %R	Samples Qualified	Qualification Codes
Antimony	^{159}Tb	121	WRBG-4-T02N-PLTU	UJ IS-I
Cadmium	^{159}Tb	121		J IS-I
Selenium	^{45}Sc	145		J IS-I
Nickel	^{115}In	59.5	WTBG-1-T02N-PLTU	J IS-I

Table 1.4
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Molybdenum	2	1.2	WRBG-4-T02N-PLTU	J ICS-H
Antimony	2	0.5	WRBG-4-T02N-PLTU WTBG-1-T02N-PLTU	J ICS-H

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB12 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 01/02/04

Peer Reviewer: Geoff Webb Date Completed: 01/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
WTBG-3-T01N-PLTW	SA	540933	B	X	X
WTBG-3-T02N-PLTW	SA	540934	B	X	X
WTBG-3-T02D-PLTW	FD	540935	B	X	X
WTAS-1-T01N-PLTU	SA	540936	B	X	X
WTAS-1-T02N-PLTU	SA	540937	B	X	X
WTFO-3-T01N-PLTU	SA	540938	B	X	X
WTFO-3-T02N-PLTU	SA	540939	B	X	X
WTFO-1-T01N-PLTU[1]	SA	540940	B	X	X
WTFO-1-T02N-PLTU	SA	540941	B	X	X
WTBG-3-T01N-PLTU	SA	540942	B	X	X
WTBG-3-T02N-PLTU[1]	SA	540943	B	X	X
WTAS-3-T01N-PLTU	SA	540944	B	X	X
WTAS-3-T02N-PLTU	SA	540945	B	X	X
WTFO-2-T01N-PLTU	SA	540946	B	X	X
WTFO-2-T02N-PLTU	SA	540947	B	X	X
WTAS-2-T01N-PLTU	SA	540948	B	X	X
WTAS-2-T02N-PLTU	SA	540949	B	X	X
EB12	EB	540950	B	X	X

Matrix: B = Biota

QC Type: SA = Sample EB = Equipment Blank

*Modified inorganics list (TKN , % Solids)

[1]Additional sample volume collected and used for matrix QC.

Case Narrative Summary: Issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below, or in the case narrative summary to follow.

The laboratory generated an equipment blank (EB) from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentrations <5x the method blank were qualified as nondetect (U).

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

The laboratory case narrative noted the TKN analysis of the replicate associated with sample WTFO-1-T01N-PLTU yielded a Relative Percent Difference (RPD) that exceeded control criteria. The reported RPD for this sample and analyte was 29%. The control criterion referenced in the QAPP for laboratory duplicates is 50%, (when both results are greater than 5x the CRDL (RL for inorganics)), thereby removing the need to qualify this sample result for TKN on the basis of duplicate disagreement. In addition, the RPD for the duplicate analysis of lead for the same sample was noted in the case narrative as exceeding control criteria, however as the RPD of 34.6% was below 50%, no qualification was necessary.

The laboratory case narrative noted the Percent Solids results were not provided in this submittal for sample WTAS-1-T02N-PLTU, as insufficient sample volume remained after the completion of the remaining analyses.

As mentioned in the laboratory case narrative, the selenium recovery of 60.0% was below the established control limits of 75-125%. However, this recovery was above the allowable limit of 50% established by the client (URS) for these samples and was accordingly reported. The laboratory noted this low recovery was related to interference from the high concentration of nitric acid in the digestates. Due to the potential low bias in the reporting of selenium results on the basis of low LCS recovery, all selenium results were qualified as estimated (J/UJ).

The laboratory case narrative noted that during the original metals analysis, the preparatory blank associated with the samples in this delivery group yielded a concentration for lead that exceeded the reporting limit. Due to the fact that the lead concentrations in the samples exceeded the upper calibration range, lead could not be reported form the ICPMS. Accordingly, the samples were re-digested and re-analyzed yielding acceptable results with the exception of sample WTAS-1-T02N-PLTU, for which insufficient volume remained to reprep. Therefore, the ICPMS digestate for this sample was analyzed on the Trace ICP and reported for lead. This did not affect the quality or usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. However, several antimony, lead, molybdenum, sodium, and zinc results were qualified as nondetect on the basis of continuing calibration blank (CCB)or method blank (MB), as summarized in Table 1.1. After accounting for method blank contamination, only iron and manganese were detected in the equipment blank (EB12) at concentrations of 1.8 and 0.074 mg/kg respectively. All of the iron and manganese results were reported at concentrations in excess of five times the concentration found in the equipment blank, and therefore did not require qualification.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/D WTFO-1-T01N-PLTUMS WTBG-3-T02N-PLTUMS • PDS WTFO-1-T01N-PLTUA WTBG-3-T02N-PLTUA • LD WTFO-1-T01N-PLTUREP WTBG-3-T02N-PLTUREP	No	Results for various analytes were outside the 75-125% recovery acceptance range for each of the two matrix spike samples, suggesting potential biases in the reporting of results. Table 1.2 summarizes the analytes recovered outside the acceptance range of 75-125%, along with the qualifications assigned to the parent sample. Post digestion spikes were performed on all metal analytes. The post digestion spike recoveries for those analytes that did not meet the specified criterion for the initial matrix spike recoveries were reviewed. As multiple post digestion spike recoveries for these analytes were recovered outside the acceptance range of 75-125%, qualification on the basis of post digestion spike was considered necessary for the parent samples, as summarized in Table 1.2. Laboratory duplicate analysis results were reviewed to evaluate the precision of the laboratory analyses. As the criterion specified in the QAPP was attained, no qualification of results was necessary on the basis of laboratory duplicate analysis. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment for WIS plant samples.
Method QC • Serial Dilution WTBG-3-T02N-PLTU WTFO-1-T01N-PLTU • Internal Standards	No	The serial dilution analysis conducted on samples WTBG-3-T02N-PLTU and WTFO-1-T01N-PLTU was not applicable for seven and 13 of the 25 metal analytes, as 18 and 12 exhibited initial concentrations in excess of 50 times the IDL, respectively. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. Table 1.3 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The internal standard recoveries of ^{45}Sc and ^{89}Y were out for the ICPMS analyses of multiple samples in this delivery group. All associated analytes were reported from the ICP rather than the ICPMS or were reprocessed using a different internal standard. The reporting limits met the requirement of the QAPP, such that the change in instrumentation did not affect the usability of the data. No qualification of data was necessary with the exception of one selenium result (WTBG-3-T02N-PLTU), which was qualified as estimated (J) , with a low bias direction assigned, as it was reported from the ICPMS. The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples.
Field QC • Field Duplicate WTBG-3-T02N/T02D-PLTW • Rinsate Blank • Field Blank	Yes	The field duplicate agreement analysis satisfied the evaluative criteria put forth in the QAPP. As such, no data qualification was necessary on the basis of field duplicate results. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • **Metals:** Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • **Metals:** Contract Required Detection Limit The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria range, with the exception of aluminum, which reported 143.2%. Associated aluminum sample results may potentially be biased high. Sample results for aluminum were not qualified on the basis of CRDL standards. • **Metals:** Continuing Calibration Verification All CCV recoveries were reported within the acceptance range of 90-110%. Accordingly, no qualification of data was necessary on the basis of CCV results. • **Metals:** Laboratory Control Sample The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 60.0%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (MS)	0.8	0.7	0.7	0.8	0.019	0.50	WTAS-1-T02N-PLTU WTAS-2-T02N-PLTU WTAS-3-T02N-PLTU WTBG-3-T01N-PLTW WTBG-3-T02D-PLTW WTBG-3-T02N-PLTW WTBG-3-T02N-PLTU WTFO-1-T01N-PLTU WTFO-1-T02N-PLTU	U MB, CCB-I
Lead (P)	---	---	---	---	0.039	1.4	EB12	U MB-I
Molybdenum (P)	---	---	---	---	0.065	1.1	EB12	U MB-1

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
Sodium (P)	---	---	---	---	31.77	453.8	EB12 WTAS-1-T01N-PLTU WTAS-1-T02N-PLTU WTAS-2-T01N-PLTU WTAS-2-T02N-PLTU WTAS-3-T01N-PLTU WTAS-3-T02N-PLTU WTBG-3-T01N-PLTU WTBG-3-T01N-PLTW WTBG-3-T02D-PLTW WTBG-3-T02N-PLTW WTFO-1-T01N-PLTU WTFO-2-T01N-PLTU WTFO-2-T02N-PLTU WTFO-3-T01N-PLTU WTFO-3-T02N-PLTU	U MB-I
Zinc (P)	---	---	---	---	0.237	2.3	EB12	U MB-1

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit EB = Equipment Blank

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike Results And Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Qualification Codes
WTFO-1-T01N-PLTU				
Antimony	52.6	76.4	75-125%	J MS-L
Cadmium	72.1	66.0		J MS, PDS-L
Copper	133.3	108.9		J MS-H
Manganese	157.3	102.6		J MS-H
Selenium	65.8	59.8		J MS, PDS-L
Silver	69.2	76.7		J MS-L
Titanium	136.9	91.7		J MS-H
WTBG-3-T02N-PLTU				
TKN	200.6	NA	75-125%	J MS-H
Antimony	20.9	54.2		J MS, PDS-L
Cadmium	49.2	51.9		
Cobalt	45.4	37.0		
Selenium	31.0	29.1		
Molybdenum	69.4	84.0		J MS-L
Silver	60.8	66.0		J MS, PDS-L
Thallium	46.4	54.2		

Table 1.3
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
WTBG-3-T02N-PLTU		
Aluminum	15.4	J DL-L
Barium	13.1	
Cadmium	82.7	
Calcium	17.0	
Cobalt	89.7	
Chromium	16.6	
Copper	14.2	
Iron	17.4	
Lead	16.6	
Magnesium	14.8	
Manganese	19.1	
Molybdenum	16.1	
Silver	29.7	
Nickel	19.3	
Potassium	30.2	
Titanium	19.0	
Vanadium	14.8	
Zinc	20.0	
WTFO-1-T01N-PLTU		
Cobalt	18.2	J DL-L
Potassium	20.8	
Titanium	16.3	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB13 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter Date Completed: 01/02/04

Peer Reviewer: Geoff Webb Date Completed: 01/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
WRFO-2-T01N-PLTW	SA	541738	B	X	X
WRFO-2-T02N-PLTW	SA	541739	B	X	X
WRFO-3-T01N-PLTW	SA	541740	B	X	X
WRFO-3-T02N-PLTW	SA	541741	B	X	X
WRAS-3-T02N-PLTW	SA	541742	B	X	X
WRAS-3-T01N-PLTW	SA	541743	B	X	X
WRAS-2-T02N-PLTW	SA	541744	B	X	X
WRFO-1-T01N-PLTW	SA	541745	B	X	X
WRAS-1-T01N-PLTU	SA	541746	B	X	X
WRAS-1-T01D-PLTU	FD	541747	B	X	X
WRAS-1-T02N-PLTU	SA	541748	B	X	X
WRAS-2-T01N-PLTU	SA	541749	B	X	X
WRAS-2-T02N-PLTU	SA	541750	B	X	X
WRAS-2-T01N-PLTW	SA	541751	B	X	X
WRFO-1-T02N-PLTW	SA	541752	B	X	X
WRFO-3-T01N-PLTU	SA	541753	B	X	X
WRFO-3-T02N-PLTU	SA	541754	B	X	X
WRAS-1-T01N-PLTW	SA	541755	B	X	X
WRAS-1-T02N-PLTW	SA	541756	B	X	X
WRFO-2-T01N-PLTU	SA	541757	B	X	X
EB13	EB	541758	B	X	X

Matrix: B = Biota
QC Type: SA = Sample EB = Equipment Blank
*Modified inorganics list (TKN , % Solids)

Case Narrative Summary: Issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below, or in the case narrative summary to follow.

The laboratory generated an equipment blank (EB) from the equipment used for homogenizing the tissue samples. As there were no analytes detected in the EB sample, no data qualification on the basis of equipment blank contamination was necessary.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

As mentioned in the laboratory case narrative, the selenium recovery of 56.0% for the LCS was below the established control limits of 75-125%. However, this recovery was above the allowable limit of 50% established by the client (URS) for these samples and was accordingly reported. The laboratory noted this low recovery was related to interference from the high concentration of nitric acid in the digestates. Due to the potential low bias in the reporting of selenium results on the basis of low LCS recovery, all selenium results were qualified as estimated (J/UJ).

In addition, the recoveries for arsenic and silver were low for the LCS; 72.0% for both. The samples were re-analyzed yielding results comparable to the original analytical sequence, including the low blank spike recoveries. The samples were accordingly re-digested. However, during the digestion process, the analyst inadvertently added hydrochloric acid to the digestates, which can potentially cause interference with the analysis. Since insufficient volume remained for additional re-digestion, the digestates were analyzed on the ICP/MS yielding similar results. The results from the second analysis from the original digestion are formally presented. Due to the potential low bias in the reporting of arsenic and silver results on the basis of low LCS recoveries, all arsenic and silver results were qualified as estimated (J/UJ).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	As mentioned in the laboratory case narrative, the TKN analyses for the samples in this delivery group were originally accomplished within the prescribed analytical holding time of 28 days. However, due to an unacceptable preparatory blank analysis, samples WRFO-3-T01N-PLTW, WRFO-3-T02N-PLTW, WRAS-3-T02N-PLTW, WRAS-3-T01N-PLTW, and WRAS-2-T02N-PLTW required re-analysis and were accordingly re-digested within holding time. The analyses for these samples were completed 1 day beyond the prescribed holding time and were consequently qualified as estimated (J) with an indeterminate bias direction, as summarized in Table 1.1
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. However, one antimony and chromium result and all beryllium results were qualified on the basis of continuing calibration blank (CCB)or method blank (MB), as summarized in Table 1.2. After accounting for method blank contamination, no analytes were present in the equipment blank. Therefore, no data qualification was necessary on the basis of equipment blank contamination.
Matrix QC • MS/D • LD • PDS	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for WIS plant samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Serial Dilution WRFO-2-T01N-PLTW • Internal Standards	No	The serial dilution analysis conducted on sample WRFO-2-T01N-PLTW was not applicable for 18of the 25 metal analytes, as only seven exhibited initial concentrations in excess of 50 times the IDL. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. Table 1.3 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The internal standard recoveries of ^{45}Sc, ^{89}Y, ^{159}Tb, and ^{6}Li were out for the ICPMS analyses of multiple samples in this delivery group. Table 1.4 summarizes the samples exhibiting internal standard recoveries outside the established acceptance range of the method for which qualification was necessary. For the others, the associated analyte was reported from the ICP rather than the ICPMS or was reprocessed using a different internal standard. The reporting limits met the requirement of the QAPP, such that the change in instrumentation did not affect the usability of the data. The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples.
Field QC • Field Duplicate • Rinsate Blank • Field Blank	Yes	No field QC samples were analyzed with this data package. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes," "No," or "N/A".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	No	The laboratory case narrative noted the metals analysis of the blank spike sample yielded slightly low percent recoveries for arsenic and silver, and a more significantly reduced value for selenium. As such, all arsenic, silver, and selenium results in all samples was qualified as estimated (J/UJ) with a low bias direction.
Compound Identification	Yes	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes," "No," or "N/A".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Yes	Information regarding the mass calibration and resolution are not available due to the software limitations. However, acceptable performance can be inferred from the other QC sample results, which satisfied evaluation criteria. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Holding Time Qualification

Analysis	Samples Qualified	QAPP Requirement	Time Beyond Holding Time Limit	Qualification
TKN	WRFO-3-T01N-PLTW	28 days	1 day	J HT-I
	WRFO-3-T02N-PLTW			
	WRAS-3-T02N-PLTW			
	WRAS-3-T01N-PLTW			
	WRAS-2-T02N-PLTW			

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (MS)	0.06	0.06	0.05	0.07	---	0.50	WRAS-1-T02N-PLTU	U CCB-I
Beryllium (P)	-0.30	---	---	---	-0.20	0.30	All samples	J MB-L UJ MB-L J MB,CCB-L
Chromium (MS)	---	---	---	---	0.01	0.20	EB13	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
WRFO-2-T01N-PLTW		
Chromium	13.6	J DL-L
Magnesium	11.8	
Selenium	20.9	
Potassium	19.4	
Zinc	14.9	

Table 1.4
Internal Standard Recoveries Resulting in Sample Qualifications

Analyte	IS	IS %R	Samples Qualified	Qualification Codes
Antimony	^{159}Tb	123	WRAS-1-T02N-PLTU	J IS-I
Cadmium	^{159}Tb	123	WRAS-1-T02N-PLTU	
Chromium	^{45}Sc	121-132	WRAS-3-T02N-PLTW WRAS-2-T02N-PLTU	
Selenium	^{45}Sc	133	WRAS-1-T02N-PLTU	
Vanadium	^{45}Sc	121	WRAS-3-T02N-PLTW	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WISB14 Sampling Event: 2003 WIS Plants

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 01/05/03

Peer Reviewer: Geoff Webb Date Completed: 01/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
WRFO-2-T02N-PLTU	SA	541866	B	X	X
WRFO-1-T01N-PLTU	SA	541867	B	X	X
WRFO-1-T02N-PLTU	SA	541868	B	X	X
WRAS-3-T01N-PLTU	SA	541869	B	X	X
WRAS-3-T02N-PLTU	SA	541870	B	X	X
EB14	EB	541871	B	X	X

Matrix: B = Biota
QC Type: SA = Sample EB = Equipment Blank
*Modified inorganics list (TKN , % Solids)

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory generated an equipment blank from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentration <5x the method blank were qualified as ND. Samples were then qualified based on any remaining detects.

All sample results were reported on a “wet weight” basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to “dry weight” basis results if desired.

As mentioned in the laboratory case narrative, the selenium recovery of 55.8% for the LCS was below the established control limits of 75-125%. However, this recovery was above the allowable limit of 50% established by the client (URS) for these samples and was accordingly reported. The laboratory noted this low recovery was related to interference from the high concentration of nitric acid in the digestates. Due to the potential low bias in the reporting of selenium results on the basis of low LCS recovery, all selenium results were qualified as estimated (J/UJ).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks	No	Several analytes were detected in the metals method and continuing calibration blanks. Due to the fact that all of theses analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected, no qualification of data was necessary with the exception of aluminum in the equipment blank (EB14) as nondetect. After accounting for method blank contamination, no analytes were present in the equipment blank. Therefore, no data qualification was necessary on the basis of equipment blank contamination.
Matrix QC • MS/D • LD • PDS	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for WIS plant samples.
Method QC • Serial Dilution WRFO-2-T02N-PLTU • Internal Standards	No	The serial dilution analysis conducted on sample WRFO-2-T02N-PLTU was not applicable for 15 of the 24 metal analytes, as only nine exhibited initial concentrations in excess of 50 times the IDL. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. Table 1.1 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The internal standard recovery of ^{89}Y was high for the ICPMS analysis of sample WRAS-3-T02N-PLTU. Accordingly, the molybdenum for this sample, as verified by the run-logs, was reported from the trace ICP. In addition, the internal standard recovery of ^{6}Li was high in the ICPMS analysis of sample EB14. Accordingly, the potassium for this sample, as verified by the run-logs, was reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Additionally, in reference to the yttrium internal standard recoveries, the laboratory reprocessed the molybdenum data using indium as the internal standard. As all indium recoveries were within the acceptable limits, data qualification for molybdenum was not necessary. The serial dilution results for the 2003 WIS Plants sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for WIS plant samples.
Field QC • Field Duplicate • Rinsate Blank • Field Blank	Yes	No field QC samples were analyzed with this data package. The field duplicate results for the 2003 WIS Plants sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for WIS plant samples.
Nondetect Results w/ Elevated RLs?	No	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • **Metals:** Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		• **Metals:** Contract Required Detection Limit The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria range, with the exception of aluminum, which reported 157.4%. Associated aluminum sample results may potentially be biased high. Sample results for aluminum were not qualified on the basis of CRDL standards. • **Metals:** Continuing Calibration Verification All CCV recoveries were reported within the acceptance range of 90-110%. Accordingly, no qualification of data was necessary on the basis of CCV results. • **Metals:** Laboratory Control Sample The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 55.8%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias.

Table 1.1
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
WRFO-2-T02N-PLTU		
Potassium	18.7	J DL-L
Zinc	21.1	

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE WILDLIFE IMPACT STUDY SOIL SAMPLES COLLECTED DURING THE SUMMER 2003 SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004

URS

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139834

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Narratives 3-1

Section 4 Collective Summary/Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-3
4.3 Serial Dilution Results 4-4

Section 5 Collective Summary/Assessment of Field QC Results 5-1

5.1 Field Duplicate Results 5-1
5.2 Rinsate Blank Results 5-2

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-1
6.4 Representativeness 6-1
6.5 Comparability 6-2
6.6 Sensitivity 6-2

TABLE OF CONTENTS

List of Tables

Table 1-1 Index to Location IDs and WIS IDs for Samples

Table 4-1 Field Samples Designated for Matrix QC Analyses

Table 4-2 Summary of Matrix Spike Results

Table 4-3 Field Samples Designated for Laboratory Duplicate Analysis

Table 4-4 Summary of Laboratory Duplicate Results Resulting in Qualification

Table 4-5 Field Samples Designated for Serial Dilution Analysis

Table 4-6 Summary of Serial Dilution Results

Table 5-1 Field Sample and Field Duplicate Pairs

Table 5-2 Summery of Field Duplicate Qualifications

Table 5-3 Summary of Rinsate Blank Results

List of Attachments

Attachment 1.1 Data Package WISS01

Attachment 1.2 Data Package WISS02

Attachment 1.3 Data Package WISS03

Attachment 1.4 Data Package WISS04

Attachment 1.5 Data Package WISS05

This report contains the results of the data validation conducted for 56 Wildlife Impact Study (WIS) samples and associated quality control (QC) samples collected in Summer of 2003 for the Molycorp RI/FS.

The WIS soil samples were reported in five STL Burlington data packages (WISS01, WISS02, WISS03, WISS04, and WISS05). All samples were analyzed for total metals and inorganics as defined in the RI/FS QAPP. This data validation report describes the data validation process used and presents the data review results for the soil samples and associated QC samples submitted to STL Burlington for chemical analysis. The field sample IDs and associated data package numbers are provided in Table 1-1.

Table 1-1
Index to Location IDs and WIS IDs for Samples

Data Package	Field ID Recorded on COC	QC Designation	Data Package	Field ID Recorded on COC	QC Designation
WISS01	RB01T-WSOL	RB	WISS03 (Cont.)	WRWW-1-T01N-SOL	SA/MS
	RB02T-PLTG	RB/SD		WTBS-1-T01N-SOL	SA
	WRBG-2-T01D-SOL	FD		WTCW-1-T01N-SOL	SA
	WRBG-2-T01N-SOL	SA		WTCW-2-T01N-SOL	SA
	WRBS-2-T01N-SOL	SA/MS/LD/PDS/SD		WTRR-1-T01N-SOL	SA
	WRBS-3-T01N-SOL	SA		WTRR-2-T01N-SOL	SA
	WRRR-1-T01N-SOL	SA		WTSD-1-T01N-SOL	SA
	WRSD-1-T01N-SOL	SA/MS/LD/PDS/SD		WTSD-2-T01N-SOL	SA
	WRSD-3-T01N-SOL	SA		WTSD-3-T01N-SOL	SA
	WRSG-2-T01N-SOL	SA		WTSG-3-T01N-SOL	SA/SD
	WRSG-3-T01D-SOL	FD		WTWW-3-T01N-SOL	SA
	WRSG-3-T01N-SOL	SA	WISS04	WRBS-1-T01N-SOL	SA
	WRWW-3-T01N-SOL	SA		WRCW-2-T01N-SOL	SA
	WTBS-2-T10N-SOL	SA		WRCW-1-T01N-SOL	SA
	WTBS-3-T01N-SOL	SA		WRCW-3-T01N-SOL	SA
	WTRR-3-T01N-SOL	SA		WRRR-2-T01N-SOL	SA
	WTSG-1-T01N-SOL	SA/MS/LD/PDS/SD		WTWW-1-T01N-SOL	SA
	WTSG-2-T01D-SOL	FD	WISS05	WRAS-1-T01N-SOL	SA
	WTSG-2-T01N-SOL	SA		WRAS-2-T01N-SOL	SA
	WTWW-2-T01N-SOL	SA		WRAS-3-T01N-SOL	SA
WISS02	WTCW-3-T01N-SOL	SA/SD		WRBG-1-T01N-SOL	SA
	RB02T-SOL	RB/SD		WRBG-3-T01N-SOL	SA
	RB03T-SOL	RB		WRBG-4-T01N-SOL	SA
	RB01T-PLTS	RB		WRFO-1-T01N-SOL	SA
	RB03T-PLTS	RB		WRFO-2-T01N-SOL	SA
	RB04T-PLPTS	RB		WRFO-3-T01N-SOL	SA
	RB01T-WASH	RB		WRSD-1R-T01N-SOL	SA
	RB02T-WASH	RB		WTAS-1-T01N-SOL	SA
	WRSG-1-T01N-SOL	SA		WTAS-2-T01N-SOL	SA
	WRRR-3-T01N-SOL	SA		WTAS-3-T01N-SOL	SA
	WRWW-2-T01N-SOL	SA		WTBG-1-T01D-SOL	FD
	RB05T-PLTG	RB/SD		WTBG-1-T01N-SOL	SA
	RB06T-PLTG	RB		WTBG-2-T01N-SOL	SA
	RB07T-PLTS	RB		WTBG-3-T01N-SOL	SA/MS/LD/PDS/SD
	RB03T-WASH	RB		WTF0-1-T01N-SOL	SA

Table 1-1
Index to Location IDs and WIS IDs for Samples

Data Package	Field ID Recorded on COC	QC Designation	Data Package	Field ID Recorded on COC	QC Designation
WISS03	RB11T-PLTS	RB	WISS05 (Cont.)	WTFO-2-T01N-SOL	SA
	RB12T-PLTG	RB		WTFO-3-T01N-SOL	SA
	RB04T-WASH	RB/SD		RB01T-PLT	RB/SD
	RB05T-WASH	RB		RB01T-SOL	RB
	RB08T-PLTG	RB		RB02T-PLT	RB
	RB09T-PLTG	RB/SD		RB02T-PLTW	RB
	RB10T-PLTS	RB		RB02T-SOL	RB
	WRSD-2-T01N-SOL	SA		RB03T-PLT	RB/SD
				RB03T-PLTS	RB

SA = Sample FD = Field Duplicate RB = Rinsate Blank
MS = Matrix Spike PDS = Post Digestion Spike LD = Laboratory Duplicate
SD = Serial Dilution

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate or spike duplicate analysis, post-digestion spike recoveries, ICP serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, rinsate blanks, field blanks, and trip blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e.,verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1 and is as follows: if no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used; if no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used; if no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

In all cases of professional judgement exercised in evaluating the need for qualification, the basis for the professional judgement used is provided in the data review narrative. Section 3 provides the data review narratives for each of the data packages.

The site-specific matrix spike/matrix spike duplicate (MS/MSD) results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of

that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (MS/MSD results, laboratory duplicate results, and serial dilution results) and associated sample qualification. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries which are included in Attachment 1 along with data sheets marked with assigned data qualifiers and qualifier reason codes. The reason codes and bias codes are also stored in the electronic database.

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL Burlington data package WISS05 was used to evaluate laboratory performance criteria. If any problems were noted during review of the STL Burlington laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0.

The site-specific MS results, Laboratory Duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analyses, LD analyses, and the serial dilution results with the samples collected during the sampling event.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

The table below illustrates the site-samples that were used to prepare matrix spike samples. As 4 principal MS sets were prepared and analyzed for 56 field samples (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Table 4-1
Field Samples Designated for Matrix QC Analysis

Sample ID	Matrix	Data Package	Analyses
WRBS-2-T01N-SOL	Soil	WISS01	Total Metals/Inorganics
WRSD-1-T01N-SOL	Soil	WISS01	Total Metals/Inorganics
WTSG-1-T01N-SOL	Soil	WISS01	Total Metals/Inorganics
WTBG-3-T01N-SOL	Soil	WISS05	Total Metals/Inorganics
WRWW-1-T01N-SOL	Soil	WISS03	TKN

Twenty-nine of 98 spike recoveries (approximately 30%) were outside of the laboratory historical QC acceptance limits. For the sample results that were greater than four times the spike amount, the MS results were not appropriate for assessing accuracy and precision. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

Post-digestion spikes were conducted for all analytes to aid in determining whether the matrix spike results that were out of acceptance limits were caused by the sample matrix, a bias in the analytical system, or a combination of both. Several post-digestion spikes were outside the acceptance limits. However, the matrix spike recoveries data have been used as the primary evaluation of potential matrix effects, and no data have been qualified on the basis of post digestion spikes.

The table below summarizes the results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Table 4-2
Summary of Matrix Spike Results

Analyte	Recoveries <75%	Recoveries >125%	Number of Valid Spike Results	Average MS %R	Action
Aluminum	0	0	0		None
Antimony	4	0	4	16.7	J/UJ MS – L All antimony results
Arsenic	1	0	4	85.7	J MS- L Parent sample (WTSG-1-T01N-SOL) only
Barium	0	0	4	89.8	None
Beryllium	0	0	4	88.5	None
Boron	0	0	4	85.7	None
Cadmium	0	0	4	78.1	None
Chromium	0	0	4	92.1	None
Copper	1	1	4	95.8	J MS-L Parent Sample (WTSG-1-T01N-SOL) only. J MS-H Parent Sample (WTBG-3-T01N-SOL) only.
Iron	0	0	0		None
Lead	1	0	2	69.5	J MS- L Parent sample (WTSG-1-T01N-SOL) only
Manganese	0	0	1	85.4	None
Mercury	0	1	4	111.4	J MS-H Parent Sample (WRBS-2-T01N-SOL) only Detect
Molybdenum	1	1	4	92.0	J/UJ MS Parent Samples WTBG-3-T01N-SOL, J MS-L WTSG-1-T01N-SOL, J MS-L
Selenium	3	0	4	56.2	J/UJ MS-L All selenium results except WTBG-3-T01N-SOL
Nickel	0	0	4	84.5	None
Thallium	0	0	4	105.8	None
Silver	3	0	4	72.2	J/UJ MS-L All silver results except WTBG-3-T01N-SOL
Vanadium	0	0	4	88.4	None
Zinc	2	0	4	72.0	J MS-L Parent Samples (WTSG-1-T01N-SOL and WTBG-3-T01N-SOL) only.
Chloride	0	2	4	127.3	J MS-H Parent samples (WRBS-2-T01N-SOL and WRSD-1-T01N-SOL) only.
Sulfate	0	1	4	113.3	J MS-H Parent Sample (WTBG-3-T01N-SOL) only.
Nitrate	0	0	4	111.5	None
Fluoride	0	2	4	115.1	J MS-H Parent samples (WRBS-2-T01N-SOL and WRSD-1-T01N-SOL) only.
Ammonia	1	1	4	76.3	J MS-L Parent Sample (WRBS-2-T01N-SOL) only. J MS-H Parent Sample (WTBG-3-T01N-SOL) only.
TKN	0	0	4	96.3	None
TOC	0	0	0		None
Phosphorus	2	0	2	23.6	J/UJ MS-L All phosphorus results.

With the exception of antimony, silver, and phosphorous, data qualification was limited to parent samples only. Both phosphorous matrix spikes were reported below the criteria, and all associated sample data have been qualified as estimated, with a potential low bias. One silver MS recovery for sample WTBG-3-T01N-SOL was within acceptance criteria. The remaining three out of four silver MS recoveries were low. All silver sample data, except sample WTBG-3-T01N-SOL, have been qualified as estimated with a potential low bias.

The antimony matrix spike recoveries for samples WRBG-2-T01N-SOL, WRSD-1-T01N-SOL, and WTSG-1-T01N-SOL were reported below 30%. However, at project on-set, it was known that the method of digestion for metals was not effective for antimony. As antimony is not considered to be a site-related contaminant, a separate digestion was not considered to be necessary. As such, the low antimony recoveries were not unexpected and the antimony data are considered usable in meeting project objectives in spite of the low bias. Therefore, the antimony data for samples WRBG-2-T01N-SOL, WRSD-1-T01N-SOL, and WTSG-1-T01N-SOL were qualified as estimated, with a potential low bias.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

The table below illustrates the site-samples that were used to prepare laboratory duplicate samples. As 4 LD were prepared and analyzed for 56 field samples (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Table 4-3
Field Samples Designated for Laboratory Duplicate Analysis

Sample ID	Matrix	Data Package	Analyses
WRBS-2-T01N-SOL	Soil	WISS01	Total Metals/Inorganics
WRSD-1-T01N-SOL	Soil	WISS01	Total Metals/Inorganics
WTSG-1-T01N-SOL	Soil	WISS01	Total Metals/Inorganics
WTBG-3-T01N-SOL	Soil	WISS05	Total Metals/Inorganics

With one exception, the relative percent differences (RPDs) or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within QAPP acceptance limits. The exceptions and the resultant data qualifiers are summarized in the table below.

Table 4-4
Summary of Laboratory Duplicate Results Resulting in Qualification

Analyte	Sample ID	Criterion	Action
Sulfate	WRBS-2-T01N-SOL	>50%	J D-I Parent Sample Only

Based on the LD results, the overall level of precision demonstrated is considered to be acceptable.

4.3 SERIAL DILUTION RESULTS

Serial dilution tests involve the analysis of a sample and a five-fold dilution of the same sample. When analyte concentrations are sufficiently high (i.e., greater that 50x the instrument detection limit [IDL]), the original result and diluted sample result are expected to be fairly comparable. If the results are not comparable, it is generally assumed that there are matrix interferences that are resulting in the suppression of elevation of the signal for one or more analyses.

The table below illustrates the site-samples that were used for the serial dilution test.

Table 4-5
Field Samples Designated for Serial Dilution Analysis

Sample ID	Matrix	Sub Matrix	Data Package	Analyses
WRBS-2-T01N-SOL	Soil		WISS01	Total Metals
WRSD-1-T01N-SOL	Soil		WISS01	Total Metals
WTSG-1-T01N-SOL	Soil		WISS01	Total Metals
WTBG-3-T01N-SOL	Soil		WISS05	Total Metals
WTCW-3-T01N-SOL	Soil		WISS02	Total Metals
WRWW-1-T01N-SOL	Soil		WISS03	Total Metals
WTSG-3-T01N-SOL	Soil		WISS03	Total Metals
WRBS-1-T01N-SOL	Soil		WISS04	Total Metals

The original and diluted sample results are compared by a percent difference (%D). When %Ds <10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate that the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result.

The table below summarizes the results for each analyte, the number of high and low exceedances, and the number of serial dilution results that were considered valid (i.e., the sample concentration was greater than 50 times their IDL).

Table 4-6
Summary of Serial Dilution Results

Analyte	Avg. %D	%Ds >10%	Potential Bias		Number of Valid Results	Action
			Low	High		
Aluminum	10.6		2	0	7	J/UJ DL – L Parent Samples only; samples WRBS-2-T01N-SOL and WRSD-1-T01N-SOL
Antimony		NA				None
Arsenic		NA				None
Barium	8.4	2	2	0	6	J/UJ DL – L Parent Samples only; samples WRBS-2-T01N-SOL and WRSD-1-T01N-SOL
Beryllium		NA				None
Boron		NA				None
Cadmium		NA				None

Analyte	Avg. %D	%Ds >10%	Potential Bias		Number of Valid Results	Action
			Low	High		
Calcium	12.9	4	4	0	7	J/UJ DL – L Parent Samples only; samples WRBS-2-T01N-SOL, WRSD-1-T01N-SOL, WTSG-1-T01N-SOL, and WTSG-3-T01N-SOL
Chromium	9.9	1	1	0	7	J/UJ DL – L Parent Samples only; samples WRBS-2-T01N-SOL
Cobalt		NA				None
Copper	6.7	1	0	0	7	J/UJ DL – L Parent Samples only; samples WRBS-2-T01N-SOL
Iron	10.7	3	3	0	6	J DL-L Parent Samples (WRBS-2-T01N-SOL) Only
Lead	16.6	7	7	0	7	J/UJ DL – L All lead results
Manganese	10.5	3	3	0	7	J/UJ DL – L Parent Samples only; samples WRBS-2-T01N-SOL, WTCW-3-T01N-SOL, and WTSG-3-T01N-SOL
Magnesium	10	1	1	0	7	J DL-L Parent Samples (WRBS-2-T01N-SOL.) Only
Molybdenum	9.7	0	0	0	3	None
Selenium		NA				None
Nickel	13.5	4	4	0	5	J/UJ DL – L Parent Samples only; samples WRBS-2-T01N-SOL, WTSG-1-T01N-SOL. WTCW-3-T01N-SOL, and WTSG-3-T01N-SOL
Potassium	18.5	7	7	0	7	J/UJ DL – L All results
Thallium		NA				None
Silver		NA				None
Sodium		NA				None
Vanadium	10.2	1	1	0	7	J DL-L Parent Samples (WRBS-2-T01N-SOL) Only
Zinc	11.4	4	4	0	7	J/UJ DL – L Parent Samples only; samples WRBS-2-T01N-SOL, WRSD-1-T01N-SOL, WRBS-1-T01N-SOL, and WTSG-3-T01N-SOL
Titanium	10	2	2	0	7	J/UJ DL – L Parent Samples only; samples WRBS-2-T01N-SOL, and WTSG-3-T01N-SOL

Evaluation of the serial dilution results for metals where some %D, exceeded 10% indicates that the average %D was either below or close to 20% for most metals. For these metals, the analysis is considered to be in control and there is no indication of a pervasive matrix analytical problem. Therefore, only the result for the associated parent samples were qualified as estimated. Affected metals were aluminum (%D 10.6), barium (%D 8.4%), calcium (%D 12.9%), chromium (%D 9.9%), copper (%D 6.7), iron (%D 10.7%), manganese (%D 10.5%), magnesium (%D 10%), nickel (%D 13.5%), titanium (%D 10%) and zinc (%D 11.4%). All potassium and lead %Ds exceeded 10%. These data are considered to be indicative of a pervasive problem relative to lead and potassium, and all lead and potassium sample results were qualified as estimated with a potential low bias to the reported results.

The site-specific blanks (rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

5.1 FIELD DUPLICATE RESULTS

Four field duplicate samples were collected during this sampling event. As there were 56 field samples, the frequency of field duplicate collection satisfied the QAPP requirement of 5%. The field duplicate pairs are listed in the table below.

Table 5-1
Field Sample and Field Duplicate Pairs

Sample ID	Matrix	Data Package	Analyses
WRBG-2-T01N-SOL/WRBG-2-T01D-SOL	Soil	WISS01	Total Metals/Inorganics
WTSG-2-T01N-SOL/WTSG-2-T01D-SOL	Soil	WISS01	Total Metals/Inorganics
WRSG-3-T01N-SOL/WRSG-3-T01D-SOL	Soil	WISS01	Total Metals/Inorganics
WTBG-1-T01N-SOL/WTBG-1-T01D-SOL	Soil	WISS05	Total Metals/Inorganics

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤50% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL as the reporting limit. For field duplicate pairs where the sample or duplicate concentration was less than five times the reporting limits, the absolute difference between the sample and duplicate was compared to the criterion of ≤ four times the greater RL. With the two exceptions in the table below, the results for all analytes for the five field duplicate pairs satisfied the applicable evaluation criterion.

Table 5-2
Summary of Field Duplicate Qualifications

Analyte	Sample ID	Criterion	Criterion Exceedance	Action
TKN	WRBG-2-T01N-SOL/ WRBG-2-T01D-SOL	≤ 50% RPD	95%	J FD-I Parent/Field Duplicate Samples Only
TKN	WRSG-3-T01N-SOL/ WRSG-3-T01D-SOL	≤ 50% RPD	62%	J FD-I Parent/Field Duplicate Samples Only
Phosphorus	WRSG-3-T01N-SOL/ WRSG-3-T01D-SOL	≤ 50% RPD	55%	J FD-I Parent/Field Duplicate Samples Only

RPD Criteria ≤50%

Based on the FD results, the overall level of precision demonstrated is considered to be acceptable. Only the parent/field duplicate sample pairs were qualified for the TKN and phosphorus exceedances of evaluation criteria.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. A total of five rinsate blank samples were associated with the collection of the WIS soil samples. The associated rinsate blank samples were RB01T-WSOL-052903, RB02T-SOL-053003, RB01T-SOL-090703, and RB02T-SOL-090903. As five rinsate blanks were prepared and analyzed for 56 environmental samples, the QAPP frequency for rinsate blank QC samples (5%) was satisfied. Table 5-3 below summarizes the detected rinsate blank results.

Table 5-3
Summary of Rinsate Blank Results

Analyte	Sample ID	Conc (µg/L)	RL (µg/L)	Frequency of Detection	Ave Conc (µg/L)	Min of Field Sample Range (mg/kg)	Max of Field Sample Range (mg/kg)
Aluminum	RB02T-SOL-090903	35.1	22.1	1 of 5	17.1	7890	24800
Ammonia	RB01T-SOL-090703	0.04	0	4 of 5	0.1	9.9	171
	RB01T-WSOL-052903	0.052					
	RB02T-SOL-053003	0.084					
	RB03T-SOL-053003	0.088					
Chloride	RB02T-SOL-053003	8	0.4	2 of 5	3.3	1.8	15.1
	RB03T-SOL-053003	8.4					
Specific Conductance	RB01T-WSOL-052903	0.11	0	3 of 5	0.1	10.6	1660
	RB02T-SOL-053003	0					
	RB03T-SOL-053003	0.61					
Sulfate	RB01T-SOL-090703	0.44	0.2	2 of 5	0.4	0.86	1240
	RB01T-WSOL-052903	0.55					
Thallium	RB01T-SOL-090703	0.31	0.1	1 of 5	0.1	0.11	0.28
Total Kjeldahl Nitrogen	RB02T-SOL-090903	0.71	0.24	1 of 5	0.2	88.7	2970
Zinc	RB02T-SOL-053003	3.4	2.5	1 of 5	1.8	40	240

For ammonia, chloride, sulfate and specific conductance detected results were reported in greater than 25% of the total number of rinsate samples and for aluminum, thallium, TKN, and zinc detected results were only reported in one rinsate blank. It is considered that low-levels of detected concentrations may be attributable to contamination. Evaluation of the range of detected concentrations for each analyte reported in the rinsates provides an indication of the reasonable maximum likely contribution for each of these analytes. Since the detected concentrations in the rinsate blank samples were low level, it was considered that these results are not indicative of systematic contamination. No data have been qualified on the basis of the rinsate blank samples associated with the WIS soil samples.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank contamination. Some sample results were qualified as estimated on the basis of the MS or LCS results. A general overall assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

Approximately 96% of the field duplicate results and 99% of the LD results satisfied the applicable criteria. As such, the overall level of precision demonstrated is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of LCSs and MS.

Approximately 98% of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP which is considered to be indicative of acceptable overall accuracy with respect to the analytical system.

Seventy percent of the MS spike recoveries satisfied the applicable evaluation criteria for accuracy specified in QAPP which is considered to be indicative of acceptable overall accuracy attained with respect to the site matrix.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

Sixty WIS soil samples were submitted for metals and inorganic analyses. All of the results for the fifty-nine samples analyzed (56 field samples and 4 field duplicates) are considered usable as qualified for meeting project objective. As such, the completeness for the samples analyzed is 100% which satisfies the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the plants. The close agreement between the field duplicate results is considered to indicate that the samples collected are adequately representative of the medium sampled. Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. As noted in Section 6.1, 99% of the LD results satisfied the precision evaluation indicating that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analyses. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. While it is anticipated that all non-rejected data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WISS01 Sampling Event: Summer 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 12/08/03

Peer Reviewer: Geoff Webb Date Completed: 12/12/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inoganics
RB01T-WSOL	RB	528950	W	X	X
RB02T-PLTG	RB	528949	W	X	X
WRBG-2-T01D-SOL	FD	528945	S	X	X
WRBG-2-T01N-SOL	SA	528944	S	X	X
WRBS-2-T01N-SOL(1)	MS	528942	S	X	X
WRBS-3-T01N-SOL	SA	529191	S	X	X
WRRR-1-T01N-SOL	SA	529190	S	X	X
WRSD-1-T01N-SOL(1)	MS	528943	S	X	X
WRSD-3-T01N-SOL	SA	529188	S	X	X
WRSG-2-T01N-SOL	SA	528948	S	X	X
WRSG-3-T01D-SOL	FD	528947	S	X	X
WRSG-3-T01N-SOL	SA	528946	S	X	X
WRWW-3-T01N-SOL	SA	529189	S	X	X
WTBS-2-T10N-SOL	SA	528917	S	X	X
WTBS-3-T01N-SOL	SA	528919	S	X	X
WTRR-3-T01N-SOL	SA	529193	S	X	X
WTSG-1-T01N-SOL(1)	MS	529192	S	X	X
WTSG-2-T01D-SOL	FD	528916	S	X	X
WTSG-2-T01N-SOL	SA	528915	S	X	X
WTWW-2-T01N-SOL	SA	528918	S	X	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field blank FD = Field Duplicate

(1) Additional sample volume provided and used for matrix QC.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Nitrate as N. This analyte has a specified holding time in the QAPP of 48 hours for soil and sediment samples. The samples were held at 4°C from their time of collection to the time of sample preparation and analysis. According to internal COC records, all samples were removed from storage on 6/2/03 and 6/3/03 for preparation and returned the same day. The samples were analyzed within 48 hours of the generation of the leachate. The sample results for nitrate were qualified as estimated (J/UJ) with an indeterminate bias for exceedance of the holding time limit. Since the nitrate is likely to be quite stable at 4°C, it was the judgment of the reviewer that nondetect results did not require rejection for the samples being analyzed after more than 2X the holding time limit. Several sample results were qualified as estimated and nitrate (water). The qualifications are summarized in Table 1.1.
Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The attached samples, result, and their qualifications from these results are summarized in Tables 1.2a and 1-2b.
Matrix QC • MS and LD WTSG-1-T01N-SOL WRSD-1-T01N-SOL WRBS-2-T01N-SOL	No	Several results were qualified on the basis of matrix spike results. The results and actions are summarized in Tables 1.3a – 1.3c. With one exception, all LD results satisfied the applicable concentration dependent evaluation criterion. The RPD for sulfate for sample WRBS-2-T01N-SOL exceeded the criterion of ≤35% with an RPD of 102%. Therefore, the sulfate result for sample WRBS-2-T01N-SOL was qualified as estimated (J) with an indeterminate bias. The matrix spike and laboratory duplicate results for the WIS soil samples will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for the WIS soil samples.
Method QC • PDS WTSG-1-T01N-SOL WRSD-1-T01N-SOL WRBS-2-T01N-SOL • Serial Dilution WTSG-1-T01N-SOL WRSD-1-T01N-SOL WRBS-2-T01N-SOL RB02T-PLTG • Internal Standards	No	Several metal results in the serial dilution analyses were outside of the ± 10% limits in the QAPP. These results and assigned qualification are summarized in Tables 1.4a – 1.4c. The serial dilution results for the WIS soil samples will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for the WIS soil samples. Initial evaluation of sample data indicated elevated yttrium internal standard recoveries. Reporting of the data was re-processed using indium as the internal standard for samples for which there was evidence of interference with the yttrium standard. For the others, the associated analyte was reported from the ICP rather than the ICPMS or was reprocessed using a different internal standard. The reporting limits met the requirement of the QAPP, such that the change in instrumentation did not affect the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate WRBG-2-T01N-SOL/WRBG-2-T01D-SOL WRSG-3-T01N-SOL/WRSG-3-T01D-SOL WTSG-2-T01N-SOL/WTSG-2-T01D-SOL • Rinsate Blank RB01T-WSOL RB02T-PLTG • Field Blank	No	With three exceptions, all FD results satisfied the applicable concentration dependent evaluation criterion. The results and actions are summarized in Tables 1.5a and 1.5b. Several target analytes were detected in the rinsate blanks after accounting for method blank contamination. The field QC results, including rinsate blanks, for the WIS soils will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for sediment samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	**Interference check standard**- No samples contained concentrations of iron comparable to those in the interference check samples (ICSs). As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements). Therefore, data qualification was not considered necessary. **LCS –** The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 68%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias

Table 1-1
Holding Time Results Outside Evaluation Criteria and Resultant Data Qualification

Analysis	Samples Qualified	QAPP Requirement	Time Beyond Holding Time Limit	Qualification
pH	WRBS-2-T01N-SOL WRSD-1-T01N-SOL WRBG-2-T01N-SOL WRBG-2-T01D-SOL WRBG-3-T01N-SOL WRSG-3-T01D-SOL WRSG-2-T01N-SOL WTSG-2-T01N-SOL WTSG-2-T01D-SOL WTBS-2-T01N-SOL WRWW-2-T01N-SOL WTBS-3-T01N-SOL	Immediately upon receipt	2-3 days after receipt	J HT-I
Conductivity	All conductivity results in this package	Immediately upon receipt	7 – 67 (RB01T-WSOL) days after receipt	J HT-I
Nitrate	All nitrate results in this package.	48 hours	2-10 days[2]	J/UJ HT-I

All samples will be given an indeterminate (I) bias code for hold time qualification.

Leachate analyzed within 48 hours preparation

Table 1.2a
Aqueous Blank Results Outside Evaluation Criteria Resulting in Data Qualification of Rinsate Blanks

Analyte	CCB (µg/L)	MB (µg/L)	IDL (µg/L)	Sample Qualified	Qualification Code
Chromium		0.191		All chromium results.	U MB-I
Lead		0.142		All lead results.	U MB-I
Manganese		0.230		All manganese results.	U MB-I
Nickel		-0.878		All nickel results	UJ MB-L
Potassium		448.4		All potassium results	U MB-I
Sodium		537.7		RB02T-PLTG	U MB-I
Titanium	0.9			RB02T-PLTG	U CCB-I
Zinc		2.272		All zinc results.	U MB-I

CCB – Continuing Calibration Blank MB – Method of Preparation Blank
IDL – Instrument Detection Limit for Metals RB Rinsate Blank

Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2b
Blank Results Outside Evaluation Criteria Resulting in Data Qualification

Analyte	CCB (µg/L)	MB (mg/kg)	IDL (µg/L)	Sample Qualified	Qualification Code
Molybdenum	0.8	0.085	0.30	WRBG-2-T01N-SOL WRBG-2-T01D-SOL WRBS-2-T01N-SOL WRRR-1-T01N-SOL WRSD-1-T01N-SOL WRSG-3-T01D-SOL WRSG-3-T01N-SOL WRWW-3-T01N-SOL	U MB-I or CCB-I

CCB – Continuing Calibration Blank MB – Method of Preparation Blank
IDL – Instrument Detection Limit for Metals RB Rinsate Blank

Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.3a
Metal Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualifications for Sample WTSG-1-T01N-SOL

Analyte	MS%R	PDS %R	Comment	Action
Antimony	13.7		Parent sample result qualified	UJ MS-L
Arsenic	69		Parent sample result qualified	UJ MS-L
Copper	69.7		Parent sample result qualified	UJ MS-L
Selenium	50	48.1	Parent sample result qualified	UJ MS-L
Molybdenum	65.4	54.7	Parent sample result qualified	UJ MS-L
Silver	65.6		Parent sample result qualified	UJ MS-L
Zinc	60.5	73.5	Parent sample result qualified	UJ MS-L

Evaluation criteria:
Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.3b
Metal Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualifications for Sample WRSD-1-T01N-SOL

Analyte	MS%R	PDS %R	Comment	Action
Antimony	12.7		Parent sample result qualified	UJ MS-L
Selenium	43.4	51.5	Parent sample result qualified	UJ MS-L
Molybdenum	40.6	45.4	Parent sample result qualified	UJ MS-L
Silver	69.9		Parent sample result qualified	UJ MS-L
Chloride	146		Parent sample result qualified	J MS-H
Fluoride	129.2		Parent sample result qualified	J MS-H

Evaluation criteria:
Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.3c
Metal Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualifications for Sample WRBS-2-T01N-SOL

Analyte	MS%R	PDS%R	Comment	Action
Antimony	9.7	72	Parent sample result qualified	UJ MS-L
Mercury	126.1		Parent sample result qualified	J MS-H
Selenium	40.7	46.4	Parent sample result qualified	UJ MS-L
Molybdenum	35.9	40.1	Parent sample result qualified	UJ MS-L
Silver	68.9		Parent sample result qualified	UJ MS-L
Chloride	147.3		Parent sample result qualified	J MS-H
Fluoride	126.8		Parent sample result qualified	J MS-H
Ammonia	27		Parent sample result qualified	UJ MS-L
Phosphorus	21.3		Parent sample result qualified	UJ MS-L

Evaluation criteria:
Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.4a
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WTSG-1-T01N-SOL

Analyte	| % D |	Action
Calcium	17.4	J DL-L
Lead	20	
Nickel	13.5	
Potassium	11.3	

QC limits ± 10 %

Table 1.4b
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WRSD-1-T01N-SOL

Analyte	| % D |	Action
Aluminum	12.6	J DL-L
Barium	11.3	
Calcium	10.6	
Lead	21.1	
Potassium	15	
Zinc	11.9	

QC limits ± 10 %

Table 1.4c
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WRBS-1-T02N-SOL

Analyte	| % D |	Action
Aluminum	19	J DL-L
Barium	16.9	
Calcium	19.8	
Chromium	19.5	
Copper	15.2	
Iron	18.7	
Lead	19.6	
Magnesium	19.3	
Manganese	19	
Nickel	22.7	
Potassium	26	
Titanium	19.7	
Zinc	21.8	

QC limits ± 10 %

Table 1.5a
Field Duplicate Pair Results Outside Evaluation Criteria Resulting in Data Qualification for WRBG-2-T01N-SOL/WRBG-2-T01D-SOL

Analyte	% RPD	Action
TKN	95	J FD-I

RPD Criteria ≤50%

Table 1.5b
Field Duplicate Pair Results Outside Evaluation Criteria Resulting in Data Qualification for WRSG-3-T01N-SOL/WRSG-3-T01D-SOL

Analyte	% RPD	Action
TKN	62	J FD-I
Phosphorus	55	

RPD Criteria ≤50%

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DATA REVIEW SUMMARY

Data Package Number: WISS02 Sampling Event: Summer 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 12/08/03

Peer Reviewer: Geoff Webb Date Completed: 12/12/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inoganics
WTCW-3-T01N-SOL	SA	529194	S	X	X
RB02T-SOL	RB	529195	W	X	X
RB03T-SOL	RB	529196	W	X	X
RB01T-PLTS	RB	529197	W	X	X
RB03T-PLTS	RB	529198	W	X	X
RB04T-PLPTS	RB	529199	W	X	X
RB01T-WASH	RB	529200	W	X	X
RB02T-WASH	RB	529201	W	X	X
WRSG-1-T01N-SOL	SA	529419	S	X	X
WRRR-3-T01N-SOL	SA	529418	S	X	X
WRWW-2-T01N-SOL	SA	529417	S	X	X
RB05T-PLTG	RB	529420	W	X	X
RB06T-PLTG	RB	529421	W	X	X
RB07T-PLTS	RB	529422	W	X	X
RB03T-WASH	RB	529423	W	X	X

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank
FB = Field blankFD = Field Duplicate

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Nitrate as N. This analyte has a specified holding time in the QAPP of 48 hours for soil and sediment samples. The samples were held at 4°C from their time of collection to the time of sample preparation and analysis. Information on the internal COC was unclear as to the schedule of sample logistics. However, although all samples were removed from storage for preparation and returned the same day it was evident that storage holding times were exceeded. The samples were analyzed within 48 hours of the generation of the leachate. The sample results for nitrate were qualified as estimated (J/UJ) with an indeterminate bias for exceedance of the holding time limit. Since the nitrate is likely to be quite stable at 4°C, it was the judgment of the reviewer that nondetect results did not require rejection for the samples being analyzed after more than 2X the holding time limit. Several sample results were qualified as estimated for exceeding the QAPP holding time requirements for conductivity, pH, nitrate and sulfate. The qualifications are summarized in Table 1.1.
Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The affect samples, results, and their qualifications from these results are summarized in Tables 1.2.
Matrix QC • MS and LD • None	N/A	This package did not contain any matrix QC results. The matrix spike and laboratory duplicate results for the WIS soil samples will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for the WIS soil samples.
Method QC • PDS None • Serial Dilution WTCW-3-T01N-SOL RB02T-SOL RB05T-PLTG • Internal Standards	No	Several metal results in the serial dilution analysis of WTCW-3-T01N-SOL were outside of the ± 10% limits in the QAPP. These results and assigned qualification are summarized in Table 1.3. The serial dilution results for the WIS soil samples will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for the WIS soil samples. Initial evaluation of sample data indicated elevated yttrium internal standard recoveries. Reporting of the data was re-processed using indium as the internal standard for samples for which there was evidence of interference with the yttrium standard. For the others, the associated analyte was reported form the ICP rather than the ICPMS or was reprocessed using a different internal standard. The reporting limits met the requirement of the QAPP, such that the change in instrumentation did not affect the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate None • Rinsate Blank RB02T-SOL RB03T-SOL RB01T-PLTS RB03T-PLTS RB04T-PLPTS RB01T-WASH RB02T-WASH RB03T0-PLTG RB02T-WASH RB05T-PLTG RB06T-PLTG RB07T-PLTS RB03T-WASH • Field Blank • Trip Blank • Other (e.g., splits)	No	Several target analytes were detected in the rinsate blanks after accounting for method blank contamination. There were no other field QC samples in this data package. The field QC results, including rinsate blanks, for the WIS soils will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for the WIS soil samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. **Interference check standard**- One sample contained concentrations of iron comparable to those in the interference check samples (ICSs). As such, it was necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements). Some ICP sample results were qualified on the basis of biases suggested by the ICS A analyses. Table 1.4 summarizes elements reported in ICS A at absolute levels greater than the IDL and samples for which qualification was necessary. **LCS –** The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 60%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias

Table 1-1
Soil and Water Holding Time Results Outside
Evaluation Criteria and Resultant Qualification

Analysis	Samples Qualified	QAPP Requirement	Time Beyond Holding Time Limit	Qualification
pH	WRWW-2-T01N-SOL WRWW-3-T01N-SOL WRSG-1-T01N-SOL	Immediately upon receipt	1 day after receipt	J HT-I
Conductivity	All conductivity results in this package	Immediately upon receipt	6-7 days after receipt	J HT-I
Sulfate	WTCW-3-T01N-SOL	28 days	7 days	J HT-I
Nitrate	All nitrate results in this package	48 hours	2-7 days[2]	J/UJ HT-I

All samples will be given an indeterminate (I) bias code for hold time qualification.
Leachate analyzed within 48 hours preparation

Table 1.2a
Laboratory Blank Results Outside Evaluation Criteria
Resulting in Data Qualification of Rinsate Blanks

Analyte	CCB (µg/L)	MB (µg/L)	IDL (µg/L)	Sample Qualified	Qualification Code
Manganese	0.3		0.20	RB02T-SOL RB03T-WASH RB06T-PLTG RB07T-PLTS	U CCB-I
Aluminum	-41.6 -48.3 -37.9	-51.740	27.7	All rinsate blank aluminum results	UJ MB,CCB-L
Potassium	475.6 426.7 704.1		327.4	RB01T-WASH RB02T-WASH RB03T-PLTS RB03T-SOL RB03T-WASH RB04T-PLTS RB05T-PLTG RB06T-PLTG	U CCB-I
Chromium	1.0	0.865	0.10	All rinsate blank chromium results	U MB, CCB-I
Lead		0.189	0.10	All rinsate blank lead results	U MB-I

CCB – Continuing Calibration Blank MB – Method of Preparation Blank
IDL – Instrument Detection Limit for Metals RB Rinsate Blank

Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Results Outside Evaluation Criteria Resulting
in Data Qualification for Sample WTCW-3-T01N-SOL

Analyte	| % D |	Action
Iron	10.9	J DL-L
Lead	12.7	
Potassium	28	
Manganese	11.2	
Nickel	11.3	

QC limits ± 10 %

Table 1.4
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Antimony	3	0.5	WTCW-3-T01N-SOL	J ICSA-H

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WISS03 Sampling Event: Summer 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 12/08/03

Peer Reviewer: Geoff Webb Date Completed: 12/12/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inoganics
RB11T-PLTS	RB	529578	W	X	X
RB12T-PLTG	RB	529579	W	X	X
RB04T-WASH	RB	529573	W	X	X
RB05T-WASH	RB	529574	W	X	X
RB08T-PLTG	RB	529575	W	X	X
RB09T-PLTG	RB	529576	W	X	X
RB10T-PLTS	RB	529577	W	X	X
WRSD-2-T01N-SOL	SA	529569	S	X	X
WRWW-1-T01N-SOL(1)	MS	529568	S	X	X
WTBS-1-T01N-SOL	SA	529813	S	X	X
WTCW-1-T01N-SOL	SA	529812	S	X	X
WTCW-2-T01N-SOL	SA	529815	S	X	X
WTRR-1-T01N-SOL	SA	529571	S	X	X
WTRR-2-T01N-SOL	SA	529817	S	X	X
WTSD-1-T01N-SOL	SA	529570	S	X	X
WTSD-2-T01N-SOL	SA	529814	S	X	X
WTSD-3-T01N-SOL	SA	529572	S	X	X
WTSG-3-T01N-SOL	SA	529811	S	X	X
WTWW-3-T01N-SOL	SA	529816	S	X	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field blank FD = Field Duplicate

(1) Additional sample volume provided and used for matrix QC for TKN only.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Nitrate as N. This analyte has a specified holding time in the QAPP of 48 hours for soil and sediment samples. The samples were held at 4°C from their time of collection to the time of sample preparation and analysis. According to internal COC records, all samples were removed from storage on 6/7/03 and 6/30/03 for preparation and returned the same day. The samples were analyzed within 48 hours of the generation of the leachate. The sample results for nitrate were qualified as estimated (J/UJ) with an indeterminate bias for exceedance of the holding time limit. Since the nitrate is likely to be quite stable at 4°C, it was the judgment of the reviewer that nondetect results did not require rejection for the samples being analyzed after more than 2X the holding time limit. Several sample results were qualified as estimated for exceeding the QAPP holding time requirements for conductivity, pH, chloride, TKN, and sulfate. The affected samples, results, and their qualifications are summarized in Table 1.1.
Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The qualifications from these results are summarized in Tables 1.2a and 1-2b.
Matrix QC • MS and LD WRWW-1-T01N-SOL (TKN only) None	N/A	The matrix spike and laboratory duplicate results for the WIS soil samples will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for the WIS soil samples.
Method QC • PDS None • Serial Dilution WRWW-1-T01N-SOL RB04T-WASH RB09T-PLTG WTSG-3-T01N-SOL • Internal Standards	No	Several metal results in the serial dilution analysis of WTSG-3-T01N-SOL were outside of the ± 10% limits in the QAPP. These results and assigned qualification are summarized in Table 1.3. The serial dilution results for the WIS soil samples will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for the WIS soil samples. The internal standard recoveries for several samples were outside the acceptance limits of 30-120%. All molybdenum results were reported from the ICP. These results and assigned qualification are summarized in Table 1.4.
Field QC • Field Duplicate None • Rinsate Blank RB-4T-WASH RB05T-WASH RB08T-PLTG RB09T-PLTG RB10T-PLTS RB11T-PLTS RB12T-PLTG • Field Blank • Trip Blank • Other (e.g., splits)	No	Several target analytes were detected in the rinsate blanks after accounting for method blank contamination. The field QC including rinsate blanks, results for the WIS soils will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for the WIS soil samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Molybdenum was reported from the ICP and nondetects are reported at a concentration of 0.20 mg/kg and the QAPP requirement for WIS soils is 0.02 mg/kg. However, the molybdenum RBSC is 2.0 mg/kg and therefore the reporting of the molybdenum results do satisfy data use objectives.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. **Interference check standard-** Three samples contained concentrations of iron comparable to those in the interference check samples (ICSs). As such, it was necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements). Some ICP sample results were qualified on the basis of biases suggested by the ICS A analyses. Table 1.5 summarizes elements reported in ICS A at absolute levels greater than the IDL and samples for which qualification was necessary. **CRDL -** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum results of 158.4%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum and iron CRDL concentrations of 40 mg/kg. Sample data have not been qualified on the basis of CRDL standards. **LCS –** The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 60%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias

Table 1-1
Holding Time Results Outside Evaluation Criteria and Resultant Data Qualification

Analysis	Samples Qualified	QAPP Requirement	Time Beyond Holding Time Limit	Qualification
pH	All pH results in this package.	Immediately upon receipt	3-6 days after receipt	J HT-I
Conductivity	All conductivity results in this package	Immediately upon receipt	6-7 days after receipt	J HT-I
Sulfate	WRWW-1-T01N-SOL WRSD-2-T01N-SOL WTSD-1-T01N-SOL WTRR-1-T01N-SOL WTSD-3-T01N-SOL WTWW-3-T01N-SOL WTRR-2-T01N-SOL	28 days	1-2 days	J HT-I
Nitrate	All nitrate results in this package	48 hours	5-29 days[2]	J/UJ HT-I
TKN	WTSG-3-T01N-SOL WTCW-1-T01N-SOL WTBS-1-T01N-SOL WTSD-2-T01N-SOL WTCW-2-T01N-SOL WTWW-3-T01N-SOL WTRR-2-T01N-SOL	28 days	3 days	J HT-I

All samples will be given an indeterminate (I) bias code for hold time qualification.
Leachate analyzed within 48 hours preparation

Table 1.2a
Blank Detections Resulting in Data Qualification of Rinsate Blanks

Analyte	CCB (µg/L)	MB (µg/L)	IDL (µg/L)	Sample Qualified	Qualification Code
Zinc		2.206		RB04T-WASH RB05T-WASH RB08T-PLTG RB09T-PLTG RB10T-PLTS RB12T-PLTG	U MB-I
Chromium		0.328		RB04T-WASH RB05T-WASH RB08T-PLTG RB09T-PLTG RB10T-PLTS RB11T-PLTS RB12T-PLTG	U MB-I
Lead		0.524		RB04T-WASH RB05T-WASH RB08T-PLTG RB10T-PLTS RB12T-PLTG	U MB-I
Manganese	0.6 0.2	3.593		RB04T-WASH RB05T-WASH RB09T-PLTG RB10T-PLTS RB11T-PLTS RB12T-PLTG	U MB-I or U MB, CCB-I

Analyte	CCB (µg/L)	MB (µg/L)	IDL (µg/L)	Sample Qualified	Qualification Code
Vanadium	0.3	0.436		RB05T-WASH RB08T-PLTG RB09T-PLTG RB11T-PLTS RB12T-PLTG	U MB-I or U MB, CCB-I

CCB – Continuing Calibration Blank MB – Method of Preparation Blank
IDL – Instrument Detection Limit for Metals RB Rinsate Blank

Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2b
Laboratory Blank Results Outside Evaluation Criteria Resulting in Data Qualification of Soil Samples

Analyte	CCB (µg/L)	MB (mg/kg)	IDL (µg/L)	Sample Qualified	Qualification Code
Sodium		107.2	532.3	All sodium results.	U MB-I
Antimony	1.0 0.9	0.071	0.50	WRWW-1-T01N-SOL WTCW-1-T01N-SOL	U MB,CCB-I
Mercury	-0.1	-0.02	0.1	All mercury results	UJ MB,CCB-L

CCB – Continuing Calibration Blank MB – Method of Preparation Blank
IDL – Instrument Detection Limit for Metals RB Rinsate Blank

Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification Sample WTSG-3-T01N-SOL

Analyte	| % D |	Action
Lead	18.9	J DL-L
Potassium	16.8	
Calcium	16	

QC limits ± 10 %

Table 1.4
Internal Standard Recoveries Outside Evaluation Criteria Resulting in Data Qualification

Sample ID	Bi %R	Sc %R	Comment	Action
WRSD-2-T01N-SOL		122.9	The selenium result was qualified.	J/UJ IS-I
WRWW-1-T01N-SOL		121.1	The selenium result was qualified.	J/UJ IS-I
WTCW-1-T01N-SOL		126.3	The selenium result was qualified.	J/UJ IS-I
WTSD-3-T01N-SOL	144		The thallium result was qualified.	J/UJ IS-I
WTSG-3-T01N-SOL		121.9	The selenium result was qualified.	J/UJ IS-I

Internal Standard limits 30-120 %

Table 1.5
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Boron	15	4.6	WTCW-2-T01N-SOL WTRR-2-T01N-SOL	J ICSA-H
Selenium	-1	0.8	WTCW-2-T01N-SOL WTRR-2-T01N-SOL WTWW-3-T01N-SOL	J ICSA-L

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WISS04 Sampling Event: Summer 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Sheri O'Connor Date Completed: 12/05/03

Peer Reviewer: Geoff Webb Date Completed: 12/12/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inoganics
WRBS-1-T01N-SOL	SA	529972	S	X	X
WRCW-2-T01N-SOL	SA	529973	S	X	X
WRCW-1-T01N-SOL	SA	529974	S	X	X
WRCW-3-T01N-SOL	SA	529975	S	X	X
WRRR-2-T01N-SOL	SA	529976	S	X	X
WTWW-1-T01N-SOL	SA	529977	S	X	X

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field blank FD = Field Duplicate

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Nitrate as N. This analyte has a specified holding time in the QAPP of 48 hours for soil and sediment samples. The samples were held at 4°C from their time of collection to the time of sample preparation and analysis. According to internal COC records (missing Internal COC for 300.0), all samples were removed from storage on 7/4/03 for preparation and returned the same day. The samples were analyzed within 48 hours of the generation of the leachate. The sample results for nitrate were qualified as estimated (J/UJ) with an indeterminate bias for exceedance of the holding time limit. Since the nitrate is likely to be quite stable at 4°C, it was the judgment of the reviewer that nondetect results did not require rejection for the samples being analyzed after more than 2X the holding time limit. Several sample results were qualified as estimated for exceeding the QAPP holding time requirements for conductivity, pH, chloride, TKN, and sulfate. The affected samples, results and their qualifications are summarized in Table 1.1.
Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The qualifications from these results are summarized in Tables 1.2.
Matrix QC • MS and LD None	N/A	This package did not contain any matrix QC results. The matrix spike and laboratory duplicate results for the WIS soil samples will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for the WIS soil samples.
Method QC • PDS None • Serial Dilution WRBS-1-T01N-SOL • Internal Standards	No	Several metal results in the serial dilution analysis of WRBS-1-T01N-SOL were outside of the ± 10% limits in the QAPP. These results and assigned qualification are summarized in Table 1.3. The serial dilution results for the WIS soil samples will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for the WIS soil samples. The internal standard recoveries for several samples were outside the acceptance limits of 30-120% for selenium. These results and assigned qualification are summarized in Table 1.4. Initial evaluation of sample data indicated elevated yttrium internal standard recoveries. Reporting of the data was re-processed using indium as the internal standard for samples for which there was evidence of interference with the yttrium standard. For the others, the associated analyte was reported form the ICP rather than the ICPMS or was reprocessed using a different internal standard. The reporting limits met the requirement of the QAPP, such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate None • Rinsate Blank None • Field Blank • Trip Blank • Other (e.g., splits)	No	The field QC results, including rinsate blanks, for the WIS soils will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for sediment samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	**Interference check standard**- Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interference elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary. **CRDL -** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum results of 156.6%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum and iron CRDL concentrations of 40 mg/kg. Sample data have not been qualified on the basis of CRDL standards. **LCS –** The LCS recovery for selenium was outside the QAPP acceptance limits of 75-125% with a recovery of 60%. Therefore, all selenium results were qualified as estimated (J/UJ) to reflect the potential low bias

Table 1-1
Holding Time Results Outside Evaluation Criteria and Resultant Data Qualification

Analysis	Samples Qualified	QAPP Requirement	Time Beyond Holding Time Limit	Qualification
pH	All pH results in this package.	Immediately upon receipt	4 days after receipt	J HT-I
Conductivity	All conductivity results in this package	Immediately upon receipt	4 days after receipt	J HT-I
Sulfate	All sulfate results in this package	28 days	1-5 days	J HT-I
Nitrate	All nitrate results in this package	48 hours	27 days[2]	J/UJ HT-I
TKN	All TKN results in this package.	28 days	3 days	J HT-I

All samples will be given an indeterminate (I) bias code for hold time qualification.
Leachate analyzed within 48 hours preparation

Table 1.2
Laboratory Blank Results Outside Evaluation Criteria Resulting in Data Qualification

Analyte	CCB (µg/L)	IDL (µg/L)	Sample Qualified	Qualification Code
Mercury	-0.1	0.10	WRBS-1-T01N-SOL	UJ CCB-L

CCB – Continuing Calibration Blank **MB** – Method of Preparation Blank
IDL – Instrument Detection Limit for Metals **RB** Rinsate Blank
Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WRBS-1-T01N-SOL

Analyte	| % D |	Action
Lead	12.8	J DL-L
Potassium	12.9	
Zinc	10.7	

QC limits ± 10 %

Table 1.4
Internal Standard Recoveries Outside Evaluation Criteria Resulting in Data Qualification

Sample ID	Y %R	Sc %R	Comment	Action
WRBS-1-T01N-SOL	350.6	135.2	Selenium result qualified	J/UJ IS-I
WRCW-1-T01N-SOL	366.4	130	Selenium result qualified	J/UJ IS-I
WRCW-2-T01N-SOL	334.4	128.8	Selenium result qualified	J/UJ IS-I
WRCW-3-T01N-SOL	331.5	130.5	Selenium result qualified	J/UJ IS-I
WRRR-2-T01N-SOL	315	126.6	Selenium result qualified	J/UJ IS-I

Internal Standard limits 30-120 %

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WISS05 Sampling Event: Summer 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Sheri O'Connor Date Completed: 12/04/03

Peer Reviewer: Geoff Webb Date Completed: 12/12/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inoganics
WRAS-1-T01N-SOL	SA	540876	S	X	X
WRAS-2-T01N-SOL	SA	540877	S	X	X
WRAS-3-T01N-SOL	SA	540872	S	X	X
WRBG-1-T01N-S0L	SA	540540	S	X	X
WRBG-3-T01N-SOL	SA	540537	S	X	X
WRBG-4-T01N-SOL	SA	540541	S	X	X
WRFO-1-T01N-SOL	SA	540873	S	X	X
WRFO-2-T01N-SOL	SA	540874	S	X	X
WRFO-3-T01N-SOL	SA	540875	S	X	X
WRSD-1R-T01N-SOL	SA	540543	S	X	X
WTAS-1-T01N-SOL	SA	540883	S	X	X
WTAS-2-T01N-SOL	SA	540882	S	X	X
WTAS-3-T01N-SOL	SA	540880	S	X	X
WTBG-1-T01D-SOL	FD	540542	S	X	X
WTBG-1-T01N-SOL	SA	540538	S	X	X
WTBG-2-T01N-SOL	SA	540536	S	X	X
WTBG-3-T01N-SOL(1)	MS	540878	S	X	X
WTF0-1-T01N-SOL	SA	540884	S	X	X
WTFO-2-T01N-SOL	SA	540881	S	X	X
WTFO-3-T01N-SOL	SA	540879	S	X	X
RB01T-PLT	RB	540885	W	X	
RB01T-SOL	RB	540539	W	X	X
RB02T-PLT	RB	540886	W	X	
RB02T-PLTW	RB	540887	W	X	
RB02T-SOL	RB	540871	W	X	X
RB03T-PLT	RB	540888	W	X	
RB03T-PLTS	RB	540870	W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field blank FD = Field Duplicate

(1) Additional sample volume provided and used for Matrix QC.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Nitrate as N. This analyte has a specified holding time in the QAPP of 48 hours for soil and sediment samples. The samples exceedence were held at 4°C from their time of collection to the time of sample preparation and analysis. According to internal COC records, all samples were removed from storage and 9/10/03 and 9/29/03 for preparation and returned the same day. The samples were analyzed within 48 hours of the generation of the leachate. The sample results for nitrate were qualified as estimated (J/UJ) with an indeterminate bias for exceedance of the holding time limit. Since the nitrate is likely to be quite stable at 4°C, it was the judgment of the reviewer that nondetect results did not require rejection for the samples being analyzed after more than 2X the holding time limit. Several sample results were qualified as estimated for exceeding the QAPP holding time requirements for conductivity, pH, nitrate (water), and sulfate. The affected samples results, and their qualifications are summarized in Table 1.1.
Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The qualifications from these results are summarized in Tables 1.2.
Matrix QC • MS and LD WTBG-3-T01N-SOL	No	Several results for sample WTBG-3-T01N-SOL were qualified on the basis of matrix spike results. The results and actions are summarized in Table 1.3. All LD results satisfied the applicable concentration dependent evaluation criterion. The matrix spike and laboratory duplicate results for the WIS soil samples will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for the WIS soil samples.
Method QC • PDS WTBG-3-T01N-SOL • Serial Dilution WTBG-3-T01N-SOL RB01T-SOL RB03T-SOL • Internal Standards	No	One metal result in the serial dilution analysis of RTCC-2-T01N-PLTB was outside of the ± 10% limits in the QAPP. These results and assigned qualification are summarized in Table 1.4. Recoveries for all post-digestion spikes were within the acceptance limits. The serial dilution results for the WIS soil samples will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for the WIS soil samples. The internal standard recoveries for several samples were outside the acceptance limits of 30-120% for selenium. These results and assigned qualification are summarized in Table 1.5. Initial evaluation of sample data indicated elevated yttrium internal standard recoveries. Reporting of the data was re-processed using indium as the internal standard for samples for which there was evidence of interference with the yttrium standard. For the others, the associated analyte was reported form the ICP rather than the ICPMS or was reprocessed using a different internal standard. The reporting limits met the requirement of the QAPP, such that the change in instrumentation did not affect the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate WTBG-1-T01N-SOL/WTBG-1-T01D-SOL • Rinsate Blank RB01T-SOL RB02T-PLT RB02T-PLTW RB02T-SOL RB03T-SOL RB03T-PLTS • Field Blank • Trip Blank • Other (e.g., splits)	No	All FD results satisfied the applicable concentration dependent evaluation criterion. Several target analytes were detected in the rinsate blanks after accounting for method blank contamination. . The field QC, including rinsate blanks results, for the WIS soils will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for sediment samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. **ICS** - One sample contained concentrations of iron comparable to those in the interference check samples (ICSs). As such, it was necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements). Some ICP sample results were qualified on the basis of biases suggested by the ICS A analyses. Table 1.6 summarizes elements reported in ICS A at absolute levels greater than the IDL and samples for which qualification was necessary.

Table 1-1
Holding Time Results Outside Evaluation Criteria and Resultant Data Qualification

Analysis	Samples Qualified	QAPP Requirement	Time Beyond Holding Time Limit	Qualification
pH	All pH results in this package.	Immediately upon receipt	4 days after receipt	J HT-I
Conductivity	All conductivity results in this package	Immediately upon receipt	9-10 days after receipt	J HT-I
Sulfate	The sulfate results for samples WTFO-3-T01N-SOL. WTAS-2-T01N-SOL, and WTFO-1-T01N-SOL	28 days	5 days	J HT-I
Nitrate	All soil nitrate results in this package	48 hours	19-20 days[2]	J/UJ HT-I
Nitrate	The nitrate result for sample RB01T-SOL	48 hours	24 hours	UJ HT-I

All samples will be given an indeterminate (I) bias code for hold time qualification.
Leachate analyzed within 48 hours preparation

Table 1.2
Laboratory Blank Results Outside Evaluation Criteria
Resulting in Data Qualification

Analyte	CCB (µg/L)	MB (µg/L)	MB (mg/Kg)	IDL (µg/L)	Sample Qualified	Qualification Code
Molybdenum	0.2 0.3 0.5		0.032	0.20	WRAS-1-T01N-SOL WRAS-2-T01N-SOL WRAS-3-T01N-SOL WRBG-1-T01N-SOL WRBG-3-T01N-SOL WRBG-4-T01N-SOL WRFO-3-T01N-SOL WRSD-1R-T01N-SOL RB01T-SOL	U MB-I Or U MB,CCB-I
Sodium			70.54	453.8	WRAS-3-T01N-SOL WRBG-1-T01N-SOL WTAS-1-T01N-SOL WTAS-2-T01N-SOL WTBG-1-T01D-SOL WTBG-1-T01N-SOL WTBG-2-T01N-SOL WTBG-3-T01N-SOL WTFO-1-T01N-SOL WTFO-3-T01N-SOL	U MB-I
Aluminum	24.8			22.1	RB01T-PLTW RB02T-PLTW RB02T-SOL	U CCB-I
Antimony	1.0 1.0	0.50		0.5	RB01T-SOL	U CCB, MB-I
Zinc		5.694		2.3	RB01T-SOL RB02T-PLT RB02T-PLTW RB02T-SOL	U MB-I

CCB – Continuing Calibration Blank MB – Method of Preparation Blank
IDL – Instrument Detection Limit for Metals RB Rinsate Blank

Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.3
Metals Matrix QC Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WTBG-3-T01N-SOL

Analyte	MS%R	Comment	Action
Antimony	30.4	Parent sample result qualified	UJ MS-L
Copper	136.2	Parent sample result qualified	J MS-H
Molybdenum	62.5	Parent sample result qualified	UJ MS-L
Zinc	57.8	Parent sample result qualified	UJ MS-L
Sulfate	134.6	Parent sample result qualified	J MS-H
Ammonia	73.5	Parent sample result qualified	UJ MS-L
Phosphorus	25.8	Parent sample result qualified	UJ MS-L

Evaluation criteria:
Matrix Spike % Recovery Limit 75 – 125 % for metals

Table 1.4
Serial Dilution Results Outside Evaluation Criteria Resulting in Data Qualification for Sample WTBG-3-T01N-SOL

Analyte	| % D |	Action
Iron	10.5	J DL-L
Lead	11.4	
Manganese	11	
Nickel	12.7	
Potassium	19.7	
Titanium	16.5	
Zinc	14.1	

QC limits ± 10 %

Table 1.5
Internal Standard Recoveries Outside Evaluation Criteria Resulting in Data Qualification

Sample ID	Y %R	Sc %R	Comment	Action
WRAS-1-T01N-SOL	350.8	120.5%	Selenium result qualified	J/UJ IS-I
WRFO-1-T01N-SOL	281.8	121.6	Selenium result qualified	J/UJ IS-I
WRFO-2-T01N-SOL	277.5	123.5	Selenium result qualified	J/UJ IS-I
WRFO-3-T01N-SOL	338.3	122.6	Selenium result qualified	J/UJ IS-I

Internal Standard limits 30-120 %

Table 1.6
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Boron	26	6.3	WTAS-2-T01N-SOL	J ICSA-H
Thallium	-2	1.4	WTAS-2-T01N-SOL	J ICSA-L

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE VEGETABLE GARDENS, SOIL, IRRIGATION WATER, AND RIPARIAN SOIL SAMPLES

Prepared for

Molycorp, Inc.
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March 2004

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Narratives 3-1

Section 4 Collective Summary/Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.1.1 Biota Matrix Spikes 4-1
4.1.2 Irrigation Water Matrix Spikes 4-1
4.1.3 Garden Soil Matrix Spikes 4-1
4.1.4 Riparian Soil Matrix Spikes 4-1
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-2
4.2.1 Biota Laboratory Duplicates 4-2
4.2.2 Irrigation Water Laboratory Duplicates 4-2
4.2.3 Garden Soil Laboratory Duplicates 4-2
4.2.4 Riparian Soil Laboratory Duplicates 4-2
4.3 Serial Dilution Results 4-3
4.3.1 Biota Serial Dilutions 4-3
4.3.2 Irrigation and Garden Water Serial Dilutions 4-3
4.3.3 Garden Soil Serial Dilutions 4-3
4.3.4 Riparian Soil Serial Dilutions 4-3

Section 5 Collective Summary/Assessment of Field QC Results 5-1

5.1 Field Duplicates 5-1
5.1.1 Biota Field Duplicates 5-1
5.1.2 Irrigation and Garden Water Field Duplicates 5-1
5.1.3 Garden Soil Field Duplicates 5-1
5.1.4 Riparian Soil Field Duplicates 5-2
5.2 Rinsate Blank Results 5-2

Section 6 Overall Data Qualify Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-1
6.4 Representativeness 6-1
6.5 Comparability 6-2
6.6 Sensitivity 6-2

TABLE OF CONTENTS

List of Attachments

Attachment 1.1	Data Package BIO044
Attachment 1.2	Data Package WAT157C
Attachment 1.3	Data Package WAT162C
Attachment 1.4	Data Package SOL084
Attachment 1.5	Data Package SOL085
Attachment 1.6	Data Package SOL086

This report contains the results of the data validation conducted for the Vegetable Garden and Riparian Soil sampling events conducted in the Summer of 2003 in support of the Molycorp RI/FS. The vegetable garden sampling consisted of sampling vegetables from local residents' gardens as well as associated soil and irrigation water. In addition, reference produce from local supermarkets was submitted for analysis. The riparian soil sampling event consisted of collecting riparian soil samples from areas along the lower Red River.

The samples were sent to Severn Trent Laboratories (STL) in Colchester, VT for metals and inorganic analyses. The results were reported in data packages BIO044, WAT157C, WAT162C and SOL084 through SOL087. The data validation reports describe the data validation process used and present the data review results for the vegetable, soil, irrigation water, and riparian soil samples and associated QC samples submitted to STL for chemical analysis. The field sample IDs and associated laboratory numbers are provided in the individual review summary included as Attachments 1 through 6 of this report.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, matrix spike recoveries, laboratory duplicate analyses, ICP serial dilution analysis agreement, and results for field quality control samples (e.g., field duplicates).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements. Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages. Data packages BIO044, WAT162C, and SOL084 were used to evaluate laboratory performance parameters and therefore, provide the assessment of overall system performance.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1, and is as follows: If no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used. If no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used. If no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

In all cases of professional judgement exercised in evaluating the need for qualification, the basis for the professional judgement used is provided in the data review narrative. Section 3 provides the data review narratives for the data package.

The site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. An evaluation of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only the parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Section 5.0 presents

the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

The results for the laboratory performance and sample-specific reviews are discussed in the individual data validation review summaries which are included in Attachments 1 through 6. The assigned validation qualifiers, reason codes, and bias codes are stored in the electronic database. The original data sheets marked with the validation qualifiers, reason codes and bias codes are stored in the project files.

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. Data packages BIO044, and WAT162C, and SOL084 were used to evaluate laboratory performance criteria. All samples were reviewed for the sample-specific criteria described in Section 2.0.

The site-specific matrix spike (MS), lab duplicate (LD), and serial dilution (SD) results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.3 present the matrix QC results associated with the vegetable, irrigation water, garden soil, and riparian soil samples and the resultant data qualifiers.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

The matrix spike recoveries were compared to the QC acceptance range of 75-125%. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

In general, qualification was limited to the parent sample if fewer than a quarter of the applicable matrix spike recoveries were outside the acceptance range. Conversely, if more than a quarter of the applicable matrix spike recoveries were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average matrix spike recovery, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

4.1.1 Biota Matrix Spikes

There were 17 garden vegetable samples collected for the Vegetable Garden Sampling Event. Sample GARDEN3-BNS-T01N-VEG was used for the matrix spike sample. As one MS sample was analyzed per 17 total field samples, the QAPP frequency criterion was met. All vegetable garden matrix spike recoveries were within evaluation criteria, therefore no additional qualifications of vegetation samples were necessary.

4.1.2 Irrigation Water Matrix Spikes

There were 5 irrigation water and 2 garden water samples collected for the Vegetable Garden Sampling Event. Sample GARDEN2-T01N-IRW was used for the matrix spike sample. As one MS sample was analyzed per 14 total field samples, the QAPP frequency criterion was met.

With one exception, all matrix spike recoveries were within 75-125%. The sulfate matrix spike recovery was 70.5%, below the lower limit of the evaluation criteria. The sulfate result for sample GARDEN2-T01N-IRW was qualified as estimated (**J MS-L**), as were the remainder of the water samples associated with the Vegetable Garden Sampling Event.

4.1.3 Garden Soil Matrix Spikes

There were 9 garden soil samples collected for the Vegetable Garden Sampling Event. There were no garden soil matrix spike samples analyzed due to an oversight. Since the LCS recoveries were within criteria, no qualifications of data were considered necessary.

4.1.4 Riparian Soil Matrix Spikes

There were 24 riparian soil samples collected for the Riparian Soil Sampling Event. Additional volume of sample RIP-8-T01N-SOL was collected for the matrix spike sample. As 1 MS sample

per 24 total field samples was analyzed, for a frequency of 4%, the QAPP frequency of 5% was not met. Since LCS recoveries were within criteria, no qualifications of data were made based on matrix spike frequency.

With two exceptions, all MS recoveries were within 75-125%. For sample RIP-8-T01N-SOL, the phosphorus matrix spike recovery, 68.7%, and the antimony matrix spike recovery, 30.5%, were below criteria. All riparian soil sample results for these analytes were qualified as estimated (**J MS-L**).

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

The relative percent differences (RPDs) or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were compared to the concentration-dependent criteria in the QAPP. For these evaluations, the USEPA Contract Laboratory Program (CLP), Contract Required Detection Limit (CRDL) was used as the reporting limit (RL) because the laboratory used the metals instrument detection limits (IDLs) as the quantitative RL and the IDL was considered to be too low for these types of evaluations.

4.2.1 Biota Laboratory Duplicates

There were 17 garden vegetable samples collected for the Vegetable Garden Sampling Event. Sample GARDEN3-BNS-T01N-VEG was used as the laboratory duplicate sample. As one LD sample analyzed per 17 total field samples, the QAPP frequency criterion was met. All laboratory duplicate results for the biota matrix were within evaluation criteria, therefore no qualifications of data were necessary.

4.2.2 Irrigation Water Laboratory Duplicates

There were 5 irrigation water and 2 garden water samples collected for the Vegetable Garden Sampling Event. Sample GARDEN2-T01N-IRW was used as the laboratory duplicate sample. As one LD sample was analyzed per 7 total field samples, the QAPP frequency criterion was met. All laboratory duplicate results for garden water samples were within acceptance limits and no qualification of data was necessary.

4.2.3 Garden Soil Laboratory Duplicates

There were 9 garden soil samples collected for the Vegetable Garden Sampling Event. There were no laboratory duplicate samples analyzed due to an oversight. No qualifications of data were made based on laboratory duplicate frequency.

4.2.4 Riparian Soil Laboratory Duplicates

There were 24 riparian soil samples collected for the Riparian Soil Sampling Event. Sample RIP-8-T01N-SOL was used for the laboratory duplicate sample. As 1 LD sample per 24 total field samples was analyzed, for a frequency of 4%, the QAPP frequency of 5% was not met.

All laboratory duplicate results were within acceptance limits and data qualification was not necessary. No qualifications of data were made based on laboratory duplicate frequency.

4.3 SERIAL DILUTION RESULTS

ICP serial dilutions are analyzed to help evaluate whether or not interferences exist due to sample matrix. When analyte concentrations are sufficiently high (defined as minimally 50x greater than the IDL), results for a straight and five fold dilution are expected to agree within 10%. Otherwise interferences resulting in signal suppression or enhancement might be suspected.

In general, qualification was limited to the parent sample if fewer than a quarter of the applicable serial dilution results were outside the acceptance range. Conversely, if more than a quarter of the applicable serial dilution results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average %D, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

4.3.1 Biota Serial Dilutions

Sample GARDEN3-BNS-T01N-VEG was used for the serial dilution analysis. All %Ds were within evaluation criteria except for potassium (13%). The potassium result for sample GARDEN3-BNS-T01N-VEG was qualified as estimated (**J DL-L**). As the exceedance was considered slight (i.e., <15%), only the parent sample result was qualified.

4.3.2 Irrigation and Garden Water Serial Dilutions

Samples GARDEN2-T01N-IRW AND GARDEN2-D01N-IRW were used for the serial dilution analyses. All %Ds, for analytes with sufficiently high analyte concentrations, were within criteria, therefore, no qualifications of data were necessary.

4.3.3 Garden Soil Serial Dilutions

There were no serial dilution samples analyzed for the garden soil samples. No qualifications of data were necessary.

4.3.4 Riparian Soil Serial Dilutions

Samples RIP-11-T01N-SOL and RIP-3-T01N-SOL were used for the riparian soil serial dilution analyses. For sample RIP-11-T01N-SOL, the nickel (10.9%) and potassium (18.3%) serial dilution %Ds were above the 10% evaluation criteria. The nickel and potassium results for sample RIP-11-T01N-SOL were qualified as estimated (**J DL-L**). For nickel, qualification was limited to the parent sample because the exceedance was considered slight. However, for potassium, qualification was extended to all riparian soil samples.

The site-specific field duplicate samples and rinsate blanks were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrices. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

5.1 FIELD DUPLICATES

The field duplicate sample analysis results may be used to evaluate the overall precision of the analyses (analytical and sampling precision) and/or the sample representativeness. The concentration dependent evaluation contained in the QAPP were used. These criteria vary by sample matrix. Similar to the laboratory duplicate evaluations, the CRDL was used as the RL for these comparisons.

In general, qualification was limited to the parent sample if fewer than a quarter of the field duplicate results were outside the acceptance range. Conversely, if more than a quarter of the field duplicate results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the magnitude of the exceedances (marginal vs. gross) and the complexity of the sample matrix.

5.1.1 Biota Field Duplicates

There were 17 garden vegetable samples collected for the Vegetable Gardens, Soil, Irrigation Water, and Riparian Soil Sampling Event. Samples GARDEN3-BNS-T01N-VEG and GARDEN3-BNS-T01D-VEG were the biota field duplicate samples. As one FD pair was collected per 17 total field samples, the QAPP frequency criterion was met. All vegetable garden field duplicate results were within evaluation criteria, therefore no qualifications of data were necessary.

5.1.2 Irrigation and Garden Water Field Duplicates

There were 5 irrigation water and 2 garden water samples collected for the Vegetable Gardens, Soil, Irrigation Water, and Riparian Soil Sampling Event. There was one field duplicate pair for the irrigation water and garden water samples, GARDEN3-T01N-IRW and GARDEN3-T01D-IRW and their dissolved metals counterpart results were collected as the aqueous field duplicate samples. As one FD pair (total and dissolved) was analyzed per 7 field samples, the QAPP frequency criterion was met. All field duplicate results were within evaluation criteria except TSS. The RPD between the TSS results was 67%, exceeding the acceptance limit of $\leq$30%. The TSS results for all garden related water samples were qualified as estimated (**J FD-I**).

5.1.3 Garden Soil Field Duplicates

There were 9 garden soil samples collected for the Vegetable Gardens, Soil, Irrigation Water, and Riparian Soil Sampling Event. Samples GARDEN3-BNS-T02N-SOL and GARDEN3-BNS-T02D-SOL were collected as the garden soil field duplicate samples. As one FD pair was analyzed per 9 total samples, the QAPP frequency criteria was met. All garden soil field

duplicate results were within evaluation criteria, therefore, no qualifications of data were necessary.

5.1.4 Riparian Soil Field Duplicates

There were 24 riparian soil samples collected for the Riparian Soil Sampling Event. There were no field duplicate samples collected for the riparian soils due to an oversight. No qualifications of data were necessary.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. One rinsate blank, RB01T-SOL, was collected for the Vegetable Garden, and Riparian Soil Sampling Events. Results for all analytes were nondetect, therefore, no qualifications of data were necessary.

Rinsate blanks were not necessary for vegetable and garden water samples because the vegetables were hand-picked using clean gloves, changed between locations and aqueous sample bottles were filled directly from the tap or hose.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank contamination. In addition, some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summary. A general overall assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

All lab duplicate results satisfied the applicable evaluation criteria. As such, the overall level of precision demonstrated is considered to be acceptable. With one exception, all field duplicate results satisfied the applicable evaluation criteria. As 99% of the field duplicate results were within acceptance limits, the overall level of precision demonstrated, both analytical and combined analytical and sampling, is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery for LCS and MS samples.

All (100%) of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP. Additionally, 183 out of 186 (98%) of the matrix spike results satisfied the applicable evaluation criteria for accuracy specified in the QAPP. This indicates acceptable overall accuracy with respect to the analytical system.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements in relation to the number of measurements requested.

All samples yielded valid results for all target analytes, consequently the completeness achieved was 100%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the garden vegetable samples, garden irrigation water, garden soil, and riparian soil samples. Except for riparian soils, for which field duplicates were inadvertently not collected, the close agreement between the field duplicate results, as discussed above in Section 6.1, indicates that the samples collected were adequately representative of the media sampled.

Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. Again, the close agreement between duplicates noted in Section 6.1 indicates that except for garden soils for which a laboratory duplicate was not analyzed, sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable Samples when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals for selected aqueous samples. As such, some nondetect results with elevated reporting limits were obtained. However, it is anticipated that all data will be usable in the risk assessment. No screening level criteria for biota were provided in the QAPP or the Baseline Ecological Risk Assessment for which IDLs for nondetect analytes could be compared. But, additional evaluation criteria have been decided upon during multi-agency progress meetings that have occurred since the QAPP was issued. As such, it is the ultimate responsibility of the data user to evaluate whether the RLs obtained for nondetect results will be sufficient for meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: BIO044 Sampling Event: Vegetable Garden

Matrix: Soil ____ Sediment ____ Water ____ Biota X

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Kathie Teuscher Date Completed: 11/03/03

Peer Reviewer: Peggy Schuler Date Completed: 11/5/03

SUMMARY OF SAMPLES WITH ANALYSES

Field ID	QC Type	Lab ID	Matrix	Analyses
				Metals
GARDEN1-BNS-T01N-VEG	SA	537259	B	X
GARDEN1-ZUC-T01N-VEG	SA	537260	B	X
GARDEN1-LET-T01N-VEG	SA	537261	B	X
EB044	EB	537262	W	X
GARDEN2-BNS-T01N-VEG	SA	537271	B	X
GARDEN3-BNS-T01N-VEG	SA	537272	B	X
GARDEN3-ZUC-T01N-VEG	SA	537273	B	X
GARDEN3-LET-T01N-VEG	SA	537274	B	X
GARDEN3-LET-T01D-VEG	SA	537275	B	X
PRODUCE1-LET-T01N-VEG	SA	537478	B	X
PRODUCE1-BNS-T01N-VEG	SA	537479	B	X
PRODUCE1-ZUC-T01N-VEG	SA	537480	B	X
GARREF1-ZUC-T01N-VEG	SA	537481	B	X
GARREF1-BNS-T01N-VEG	SA	537482	B	X
GARREF1-LET-T01N-VEG	SA	537483	B	X
GARREF2-BNS-T01N-VEG	SA	537934	B	X
GARREF2-ZUC-T01N-VEG	SA	537935	B	X
GARREF2-LET-T01N-VEG	SA	537936	B	X
EB044A	EB	537937	W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank EB = Laboratory Equipment Blank FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

Equipment Blanks were generated by the laboratory during the tissue homogenization step of sample preparation for biota samples. These blanks were processed with the samples and were evaluated as an additional Method Blank associated with the samples.

The case narrative noted that all sample results are reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific ***Parameters***	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks Calibration Blanks	No	Various metals were detected in the homogenization (equipment) blank, the metals preparation blanks, and continuing calibration blanks. Table 1.1 summarizes the metals blank detections and the resultant data qualifications (limited to those samples and analytes requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS GARDEN3-BNS-T01N-VEG • PDS GARDEN3-BNS-T01N-VEG • LD GARDEN3-BNS-T01N-VEG	Yes	The matrix spike concentrations were within 4x the sample concentrations and, therefore appropriate for assessing accuracy. The matrix spike recoveries were within the QC acceptance criteria of 75 – 125%. The post-digestion spike and the lab duplicate results were within QC criteria for all metals. The matrix quality control results for the Vegetable Garden sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Vegetable Garden sampling event.
Method QC • Serial Dilution GARDEN3-BNS-T01N-VEG • Internal Standards	No	The serial dilution analyses were not applicable for 20 metals with original results less than 50 time the IDL. For the remaining four (4) metals (calcium, magnesium, manganese, and potassium), the percent difference between the original results and the results for a 5-fold dilution exceeded the ≤10% criterion for potassium only (13%). The method quality control results for the Vegetable Garden sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Vegetable Garden sampling event.
Field QC • Field Duplicate GARDEN3-BNS-T01N/D-VEG • Rinsate Blank • Other (e.g. Splits)		One field duplicate pair was submitted with this SDG. The QAPP precision criteria were satisfied for all metals. Rinsate blanks, if any, were analyzed and reported with water samples, and will be evaluated at a later date. The field QC results for the Vegetable Garden sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the Vegetable Garden sampling event.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 10-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	In addition to sample specific parameters, laboratory performance parameters were reviewed for this package. The results of this evaluation are provided below.

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes", "No", or 'Not Applicable"	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification and Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). When contacted for comment, the laboratory stated that the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification of Summary Form Data • %Rec Calc • %D Calc • RPD Calc	Yes	
Method Specific QC • Tuning • ICSA/AB • Thermal Stability • Spectral Resolution • Mass Calibration	Yes	Information regarding the mass calibration and resolution are not available due to software limitations. However, acceptable performance can be inferred from the other QC sample results, which satisfied evaluation criteria. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Aluminum (P)	20.3 to 45.9 (CCB1, 2, 4)		2.7 and 2.4	18.3	GARDEN1-BNS-T01N-VEG GARDEN1-ZUC-T01N-VEG GARDEN2-BNS-T01N-VEG GARDEN3-BNS-T01N-VEG GARDEN3-LET-T01N-VEG GARDEN3-LET-T01D-VEG PRODUCE1-LET-T01N-VEG PRODUCE1-BNS-T01N-VEG PRODUCE1-ZUC-T01N-VEG GARREF1-ZUC-T01N-VEG GARREF1-BNS-T01N-VEG GARREF1-LET-T01N-VEG GARREF2-BNS-T01N-VEG GARREF2-ZUC-T01N-VEG	U MB,CCB-I
Copper (P)		0.15	0.15	1.8	GARDEN1-BNS-T01N-VEG GARDEN1-ZUC-T01N-VEG GARDEN3-ZUC-T01N-VEG GARDEN3-LET-T01N-VEG GARREF1-LET-T01N-VEG GARREF2-LET-T01N-VEG	U MB-I

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Iron	19 (CCB4)		1.8	16.8	GARDEN1-BNS-T01N-VEG GARDEN1-ZUC-T01N-VEG GARDEN3-ZUC-T01N-VEG GARDEN3-LET-T01N-VEG PRODUCE1-BNS-T01N-VEG PRODUCE1-ZUC-T01N-VEG GARREF1-ZUC-T01N-VEG GARREF1-BNS-T01N-VEG GARREF2-BNS-T01N-VEG GARREF2-ZUC-T01N-VEG	U MB-I U MB-I U MB-I U MB-I U MB-I U MB-I U MB-I U MB-I U MB,CCB-I U MB,CCB-I
Lead (P)			0.2	1.5	GARDEN3-LET-T01D-VEG PRODUCE1-BNS-T01N-VEG GARREF2-LET-T01N-VEG	U MB-I
Nickel (P)		-0.37		2.0	GARDEN1-BNS-T01N-VEG GARDEN1-ZUC-T01N-VEG GARDEN1-LET-T01N-VEG GARDEN2-BNS-T01N-VEG GARDEN3-BNS-T01N-VEG GARDEN3-ZUC-T01N-VEG GARDEN3-LET-T01N-VEG GARDEN3-LET-T01D-VEG PRODUCE1-LET-T01N-VEG PRODUCE1-BNS-T01N-VEG PRODUCE1-ZUC-T01N-VEG GARREF1-ZUC-T01N-VEG GARREF1-BNS-T01N-VEG GARREF1-LET-T01N-VEG GARREF2-BNS-T01N-VEG GARREF2-ZUC-T01N-VEG GARREF2-LET-T01N-VEG	J / UJ MB-L
Silver (P)		-0.235		0.9	GARDEN1-BNS-T01N-VEG GARDEN1-ZUC-T01N-VEG GARDEN1-LET-T01N-VEG GARDEN2-BNS-T01N-VEG GARDEN3-BNS-T01N-VEG GARDEN3-ZUC-T01N-VEG GARDEN3-LET-T01N-VEG GARDEN3-LET-T01D-VEG PRODUCE1-LET-T01N-VEG PRODUCE1-BNS-T01N-VEG PRODUCE1-ZUC-T01N-VEG GARREF1-ZUC-T01N-VEG GARREF1-BNS-T01N-VEG GARREF1-LET-T01N-VEG GARREF2-BNS-T01N-VEG GARREF2-ZUC-T01N-VEG	UJ MB-L

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	EB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Sodium (P)		57	84.2 and 63.9	218.8	GARDEN1-BNS-T01N-VEG GARDEN1-ZUC-T01N-VEG GARDEN1-LET-T01N-VEG GARDEN2-BNS-T01N-VEG GARDEN3-BNS-T01N-VEG GARDEN3-ZUC-T01N-VEG GARDEN3-LET-T01N-VEG GARDEN3-LET-T01D-VEG PRODUCE1-BNS-T01N-VEG PRODUCE1-ZUC-T01N-VEG GARREF1-ZUC-T01N-VEG GARREF1-BNS-T01N-VEG GARREF1-LET-T01N-VEG GARREF2-BNS-T01N-VEG GARREF2-ZUC-T01N-VEG	U MB-I.
Zinc (P)			0.8	5.7	GARDEN1-BNS-T01N-VEG GARDEN1-ZUC-T01N-VEG	U MB-I.

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT157C Sampling Event: Vegetable Garden

Matrix: Soil ___Sediment___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Peggy Schuler Date Completed: 10/30/03

Peer Reviewer: Kathie Teuscher Date Completed: 11/06/03

SUMMARY OF SAMPLES WITH ANALYSES

Field ID	Sample Date	QC Type	Lab ID	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
GARDEN1-T01N-IRW	08/06/2003	SA	537091	W	X	X	X	X
GARDEN1-D01N-IRW	08/06/2003	SA	537092	W	X			
GARDEN2-T01N-IRW	08/09/2003	SA	537356	W	X	X	X	X
GARDEN2-D01N-IRW	08/09/2003	SA	537357	W	X			
GARDENREF1-T01N-GRW	08/10/2003	SA	537358	W	X	X	X	X
GARDENREF1-D01N-GRW	08/10/2003	SA	537359	W	X			
MW-25-T01N-GRW	08/10/2003	SA	537360	W	X	X		
MW-25-D01N-GRW	08/10/2003	SA	537361	W	X			
MW-24-T01N-GRW	08/10/2003	SA	537362	W	X	X		
MW-24-D01N-GRW	08/10/2003	SA	537363	W	X			
MW-22-T01N-GRW	08/10/2003	SA	537364	W	X	X		
MW-22-D01N-GRW	08/10/2003	SA	537365	W	X			
MW-20-T01N-GRW	08/10/2003	SA	537366	W	X	X		
MW-20-D01N-GRW	08/10/2003	SA	537367	W	X			
MW-21-T01N-GRW	08/10/2003	SA	537368	W	X	X		
MW-21-D01N-GRW	08/10/2003	SA	537369	W	X			
MMW-31B-T01N-GRW	08/10/2003	SA	537370	W	X	X		
MMW-31B-D01N-GRW	08/10/2003	SA	537371	W	X			
MW-1-T01N-GRW	08/10/2003	SA	537372	W	X	X		
MW-1-D01N-GRW	08/10/2003	SA	537373	W	X			

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

Selected analyses were performed after the holding time had expired due to unforeseen delays in the delivery of samples via overnight courier. See "Holding Times" below.

The recovery of boron in one continuing calibration verification exceeded the upper limit of 110% at 111.2%. The positive boron result in associated sample MW-1-D01N-GRW was qualified as estimated with a possible high bias.

Review Parameter	Criteria Met?	Comments
Sample-specific ***Parameters***	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	pH: Analyses of all samples were performed at least 40 hours after sample collection. According to both the QAPP and the method, pH should be analyzed "immediately." All results for pH were therefore qualified as estimated (J with indeterminate bias). Nitrate as N: Analyses of three samples were performed >48 hours, but <96 hours, after sample collection. The QAPP holding time for a water is 48 hours. The results for nitrate in these samples were therefore qualified as estimated (J/UJ with indeterminate bias). Specific samples and qualifiers are listed in Table 1.1. Nitrite as N: Analyses of six samples were performed >48 hours, but <96 hours, after sample collection. The QAPP holding time for a water is 48 hours. The results for nitrite in these samples were therefore qualified as estimated (J/UJ with indeterminate bias). One sample was analyzed greater than 96 hours after collection due to a laboratory oversight. The non-detect result for this sample was rejected (R). Specific samples and qualifiers are listed in Table 1.1. Orthophosphate as P: Analyses of six samples were performed >48 hours, but <96 hours, after sample collection. The QAPP holding time is 48 hours. The results for orthophosphate in these samples were therefore qualified as estimated (J/UJ with indeterminate bias). The analysis of one sample was performed greater than 96 hours after collection. The positive result for this sample was also qualified as estimated (J with indeterminate bias). Specific samples and qualifiers are listed in Table 1.1. Biochemical Oxygen Demand (BOD): Analysis of one sample was begun >48 hours, but <96 hours, after sample collection. The QAPP holding time is 48 hours. The non-detect result for BOD in this sample was therefore qualified as estimated (UJ with indeterminate bias). The analysis of another sample was begun greater than 96 hours after collection. The non-detect result for this sample was rejected (R). Specific samples and qualifiers are listed in Table 1.1.
Method Blanks	No	Various metals were detected in the metals preparation blanks and continuing calibration blanks. Table 1.2 summarizes the metals blank detections and the resultant data qualifications (limited to those analytes and samples requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC GARDEN2-D01N-IRW GARDEN2-T01N-IRW MW-1-D01N-GRW MW-1-T01N-GRW • MS • PDS • LD	No	The matrix spike recoveries for sulfate in samples GARDEN2-T01N-IRW and MW-1-T01N-GRW were below the lower QC limit of 75% (70.5% and 60.4%, respectively). The sulfate results for the parent samples were therefore qualified as estimated (J with a low bias). The matrix spike recovery for total organic carbon (TOC) in sample MW-1-T01N-GRW exceeded the upper QC limit of 125%, at 130%. The TOC result in the parent sample was therefore qualified as estimated (J with a high bias).

Review Parameter	Criteria Met?	Comments
		The matrix spike recovery for lead in sample GARDEN2-T01N-IRW exceeded the upper QC limit of 125% at 131%. However, lead was not detected in the parent sample. Therefore, no qualifications were required. The lab duplicate RPD for sample MW-1-T01N-GRW for total suspended solids (TSS) exceeded the QC limit of 20%, at 28%. The TSS result in the parent sample was therefore qualified as estimated (J with an indeterminate bias). The matrix quality control results for the Vegetable Garden sampling event will be evaluated collectively and any additional data qualifications will be summarized in the overall assessment for the sampling event.
Method QC • Serial Dilution GARDEN2-D01N-IRW GARDEN2-T01N-IRW MW-1-D01N-GRW MW-1-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	YES	The method QC for the Vegetable Garden sampling event will be evaluated collectively and any resulting data qualifications will be summarized in the overall assessment for the sampling event.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank • Other (e.g. Splits)	N/A	No field duplicate pairs or blanks were submitted with this SDG. The field QC results for the Vegetable Garden sampling event will be evaluated collectively and any resulting data qualification will be summarized in the overall assessment for the sampling event.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 2-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results No samples contained concentrations of interferent elements comparable to those in the interference check samples (ICSs). As such, it was not necessary to evaluate any biases in sample results suggested by the results for the ICS A analyses.

Table 1.1
Holding Time Qualifications

Analytes	Qualified Samples	Qualification and Qualification Codes
pH	All Samples	J HT – I
Nitrate-N	GARDEN2-T01N-IRW MW-25-T01N-GRW MW-1-T01N-GRW	J HT – I or UJ HT – I
Nitrite-N	MMW-31B-T01N-GRW GARDEN2-T01N-IRW GARDENREF1-T01N-GRW MW-25-T01N-GRW MW-24-T01N-GRW MW-22-T01N-GRW MW-1-T01N-GRW	R HT J HT – I or UJ HT - I

Table 1.1
Holding Time Qualifications

Analytes	Qualified Samples	Qualification and Qualification Codes
Orthophosphate-P	GARDEN2-T01N-IRW GARDENREF1-T01N-GRW MW-25-T01N-GRW MW-24-T01N-GRW MW-22-T01N-GRW MW-20-T01N-GRW MW-1-T01N-GRW	J HT – I or UJ HT - I
BOD	GARDEN2-T01N-IRW GARDENREF1-T01N-GRW	R HT UJ HT - I

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCBs (µg/L)	MB (µg/L)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Antimony	0.7 to 1.1		0.5	GARDEN1-T01N-IRW GARDEN2-D01N-IRW GARDEN2-T01N-IRW GARDENREF1-T01N-GRW	U CCB – I
Boron	6.1 to 7.2		4.6	GARDEN1-D01N-IRW GARDEN1-T01N-IRW MMW-31B-D01N-GRW MMW-31B-T01N-GRW MW-20-D01N-GRW MW-20-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW MW-24-D01N-GRW MW-24-T01N-GRW	U CCB – I
Beryllium	0.5 to 0.6		0.2	GARDEN2-D01N-IRW GARDEN2-T01N-IRW GARDENREF1-D01N-GRW GARDENREF1-T01N-GRW	U CCB – I
Copper	-2.0 to -1.9		1.4	GARDEN2-D01N-IRW GARDEN2-T01N-IRW GARDENREF1-D01N-GRW GARDENREF1-T01N-GRW	J/UJ CCB – L
Iron	20.8, 26.2		16.8	GARDEN1-T01N-IRW MW-20-T01N-GRW	U CCB – I
Lead	1.3 to 2	1.792	1.3	GARDEN2-T01N-IRW GARDENREF1-D01N-GRW GARDENREF1-T01N-GRW	U MB, CCB – I
Manganese	-2.2		1.9	MW-1-D01N-GRW	J CCB – L
Molybdenum	2.5		1.7	GARDEN2-D01N-IRW GARDEN2-T01N-IRW	U CCB – I

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCBs (µg/L)	MB (µg/L)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Nickel	-2.6 to -2.1	-3.258	2.0	GARDEN1-D01N-IRW GARDEN1-T01N-IRW MW-1-D01N-GRW MW-1-T01N-GRW MW-20-D01N-GRW MW-20-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW MW-22-D01N-GRW MW-22-T01N-GRW MW-24-D01N-GRW MW-24-T01N-GRW MW-25-T01N-GRW	J/UJ MB – L
				GARDEN2-D01N-IRW GARDEN2-T01N-IRW GARDENREF1-D01N-GRW GARDENREF1-T01N-GRW	UJ CCB – L
Silver	-1.3 to -1		0.9	GARDEN1-D01N-IRW GARDEN1-T01N-IRW MMW-31B-D01N-GRW MMW-31B-T01N-GRW MW-1-D01N-GRW MW-1-T01N-GRW MW-20-D01N-GRW MW-20-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW MW-22-D01N-GRW MW-22-T01N-GRW MW-24-D01N-GRW MW-24-T01N-GRW MW-25-D01N-GRW MW-25-T01N-GRW	UJ CCB – L
Sodium	-1545 to 1072		532.3	MW-1-D01N-GRW	U CCB – I
				GARDEN2-D01N-IRW GARDEN2-T01N-IRW GARDENREF1-D01N-GRW GARDENREF1-T01N-GRW MMW-31B-D01N-GRW MMW-31B-T01N-GRW MW-1-T01N-GRW MW-20-D01N-GRW MW-20-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW	J/UJ CCB – L
Zinc	6.4 to 10.5	2.833	1.6	GARDEN1-D01N-IRW GARDEN1-T01N-IRW MW-20-D01N-GRW MW-20-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW MW-22-D01N-GRW MW-22-T01N-GRW MW-24-D01N-GRW MW-24-T01N-GRW MW-25-D01N-GRW MW-25-T01N-GRW	U CCB – I

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT162C Sampling Event: Vegetable Garden

Matrix: Soil __Sediment___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Peggy Schuler Date Completed: 11/05/03

Peer Reviewer: Kathie Teuscher Date Completed: 11/06/03

SUMMARY OF SAMPLES WITH ANALYSES

Field ID	Sample Date	QC Type	Lab ID	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
GARDEN3-T01N-IRW	08/07/03	SA	537676	W	(1)	(1)	(1)	(1)
GARDEN3-D01N-IRW	08/07/03	SA	537677	W	(1)			
GARDEN3-T01D-IRW	08/07/03	FD	537678	W	X	X	X	X
GARDEN3-D01D-IRW	08/07/03	FD	537679	W	X			
GARDEN3-T01N-IRW(2)	08/12/03	SA	537869	W	X	X	X	X
GARDEN3-D01N-IRW(2)	08/12/03	SA	537870	W	X			
GARDENREF2-T01N-GRW	08/12/03	SA	537871	W	X	X	X	X
GARDENREF2-D01N-GRW	08/12/03	SA	537872	W	X			

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

(1) Analyses were requested, but samples were replaced on 08/12/03.

(2) Samples were replacements for originals collected 08/07/03 (Lab IDs 537676 and 537677). See Case Narrative Summary below for explanation.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

The "GARDEN3" irrigation waters collected August 7, 2003 were received at the lab four days after sample collection due to miscommunication with the overnight courier (sample coolers were not marked for Saturday delivery). The holding times for several parameters had already been exceeded by more than double the QAPP requirements. In addition, the temperature of the samples at the time of receipt was 17ºC, significantly exceeding the upper acceptance limit of 6ºC. Due to these exceedances, the original samples (total and dissolved fractions) were recollected on August 12, 2003. Although the laboratory analyzed both sets of samples, the results from the "original" samples (collected August 7) were discarded, and only the results from the replacement samples were retained in the data set. However, no replacement samples were collected for the field duplicates. Consequently, the results from the August 7 field duplicates, where usable, were compared to the results of the August 12 primary samples to evaluate

precision. Despite the temporal difference, precision was acceptable for all but one parameter, as described below.

Review Parameter	Criteria Met?	Comments
Sample-specific ***Parameters***	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	No comments.
Holding Times	No	pH: Analyses of all samples were performed at least 40 hours after sample collection. According to both the QAPP and the method, pH should be analyzed "immediately." All results for pH were therefore qualified as estimated (J with indeterminate bias). Nitrate as N: Analyses of two samples were performed >48 hours, but <96 hours, after sample collection. The QAPP holding time for a water is 48 hours. The results for nitrate in these samples were therefore qualified as estimated (J/UJ with indeterminate bias). The analysis of another sample was performed greater than 96 hours after collection. The non-detect result in this sample was rejected (R). Specific samples and qualifiers are listed in Table 1.1. Nitrite as N: Analyses of two samples were performed >48 hours, but <96 hours, after sample collection. The QAPP holding time for water is 48 hours. The results for nitrite in these samples were therefore qualified as estimated (J/UJ with indeterminate bias). One sample was analyzed greater than 96 hours after collection. The non-detect result for this sample was rejected (R). Specific samples and qualifiers are listed in Table 1.1. Orthophosphate as P: Analyses of two samples were performed >48 hours, but <96 hours, after sample collection. The QAPP holding time is 48 hours. The results for orthophosphate in these samples were therefore qualified as estimated (J/UJ with indeterminate bias). The analysis of one sample was performed greater than 96 hours after collection. The non-detect result for this sample was rejected (R). Specific samples and qualifiers are listed in Table 1.1. Biochemical Oxygen Demand (BOD): Analyses of two samples were begun >48 hours, but <96 hours, after sample collection. The QAPP holding time is 48 hours. The non-detect results for BOD in these samples were therefore qualified as estimated (UJ with indeterminate bias). The analysis of one sample was begun greater than 96 hours after collection. The non-detect result for this sample was rejected (R). Specific samples and qualifiers are listed in Table 1.1. In addition to the qualifications described above, the results for all wet chemistry parameters and mercury were qualified as estimated (J with indeterminate bias) in samples GARDEN3-T01D-IRW and GARDEN3-D01D-IRW due to the temperature exceeding 6°C for an unknown length of time prior to receipt at the laboratory.
Method Blanks	No	Various metals were detected in the metals preparation blanks and continuing calibration blanks. Table 1.2 summarizes the metals blank detections and the resultant data qualifications (limited to those analytes and samples requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS/MSD • PDS • LD	N/A	No samples in this SDG were designated for matrix QC analyses. The matrix quality control results for the Vegetable Garden sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the sampling event.

Review Parameter	Criteria Met?	Comments
Method QC • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	No project samples in this SDG were designated for serial dilution analyses. The method quality control results for the Vegetable Garden sampling event will be evaluated collectively and any resultant data qualifications will be summarized in the overall assessment for the sampling event.
Field QC • Field Duplicate GARDEN3-T01N/D-IRW GARDEN3-D01N/D-IRW • Rinsate Blank • Field Blank • Trip Blank • Other (e.g. Splits)	No	Two field duplicate pairs were submitted with this SDG (dissolved and total fractions from the same location). Results for both pairs met the QAPP acceptance criteria, with the exception of total suspended solids (TSS) in GARDEN3-T01N/D-IRW (RPD 67%). The TSS results in both samples were qualified as estimated (J with indeterminate bias). No blanks were submitted with this SDG. The field QC results for the Vegetable Garden sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment for the Vegetable Garden sampling event.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 2-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.
Package Completeness	Yes	No comments.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	In addition to sample specific parameters, laboratory performance parameters were reviewed for this package. The results of this evaluation are provided below.
Laboratory Performance Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration • Number/Conc. of points • Goodness of Fit • Analytical sequence	Yes	No comments.
Continuing Calibration Verification • Adequate frequency? • Adequate recovery?	Yes	No comments.
Laboratory Control Sample Results • Second source? • Adequate recovery? • Replicate agreement?	Yes	No comments.
Compound Identification and Quantification • Were the proper internal standards used, as applicable? • Are reported sample results adjusted for? – DFs – Sample Size • Agreement between replicate instrument measurements?	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated that the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Verification of Summary Form Data • %Rs calculated properly? • %Ds calculated properly? • Transcription errors?	Yes	No comments.
Method Specific QC • Tuning • ICSA/AB • Thermal Stability • Spectral Resolution • Mass Calibration	Yes	No samples contained concentrations of interferent elements comparable to those in the interference check samples (ICSs). As such, it was not necessary to evaluate any biases in sample results suggested by the results for the ICS A analyses. Information regarding the ICP/MS mass calibration and resolution are not available due to software limitations. However, acceptable performance can be inferred from the other QC sample results, which satisfied evaluation criteria.

Table 1.1
Holding Time Qualifications

Analytes	Qualified Samples	Qualification and Qualification Codes
pH	GARDEN3-T01D-IRW GARDEN3-T01N-IRW (08/12) GARDENREF2-T01N-GRW	J HT – I
Nitrate-N	GARDEN3-T01D-IRW GARDEN3-T01N-IRW (08/12) GARDENREF2-T01N-GRW	R HT J HT – I or UJ HT - I
Nitrite-N	GARDEN3-T01D-IRW GARDEN3-T01N-IRW (08/12) GARDENREF2-T01N-GRW	R HT UJ HT – I
Orthophosphate-P	GARDEN3-T01D-IRW GARDEN3-T01N-IRW (08/12) GARDENREF2-T01N-GRW	R HT J HT – I or UJ HT - I
BOD	GARDEN3-T01D-IRW GARDEN3-T01N-IRW (08/12) GARDENREF2-T01N-GRW	R HT UJ HT - I
Mercury	GARDEN3-T01D-IRW GARDEN3-D01D-IRW	UJ HT - I
Conductivity Total Dissolved Solids Total Suspended Solids Chloride Hydroxide Alkalinity Carbonate Alkalinity Bicarbonate Alkalinity Total Alkalinity Fluoride, Soluble Ammonia-N Total Kjeldahl Nitrogen Phosphorus Sulfate Chemical Oxygen Demand	GARDEN3-T01D-IRW	J HT – I or UJ HT - I

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCBs (µg/L)	MB (µg/L)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Beryllium	0.2, 0.5		0.2	GARDENREF2-T01N-GRW	U CCB – I
Molybdenum	1.7		1.7	GARDENREF2-D01N-GRW GARDENREF2-T01N-GRW	U CCB – I
Nickel		-2.261	2.0	GARDEN3-D01D-IRW GARDEN3-D01N-IRW (08/12) GARDEN3-T01D-IRW GARDEN3-T01N-IRW (08/12) GARDENREF2-D01N-GRW GARDENREF2-T01N-GRW	J/UJ MB – L
Potassium		-486.3	370.7	GARDEN3-D01D-IRW GARDEN3-D01N-IRW (08/12) GARDEN3-T01D-IRW GARDEN3-T01N-IRW (08/12) GARDENREF2-D01N-GRW GARDENREF2-T01N-GRW	J MB – L
Sodium		-665.3	532.3	GARDEN3-D01D-IRW GARDEN3-D01N-IRW (08/12) GARDEN3-T01D-IRW GARDEN3-T01N-IRW (08/12)	UJ MB – L

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: SOL084 Sampling Event: Vegetable Garden

Matrix: Soil _X_ Sediment___ Water ___ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Kathie Teuscher Date Completed: 11/04/03

Peer Reviewer: Peggy Schuler Date Completed: 11/05/03

SUMMARY OF SAMPLES WITH ANALYSES

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
GARDEN1-BNS-T02N-SOL	SA	537257	S	X	X
GARDEN1-LET-T01N-SOL	SA	537258	S	X	X
GARDEN3-BNS-T02N-SOL	SA	537268	S	X	X
GARDEN3-BNS-T02D-SOL	FD	537269	S	X	X
GARDEN2-BNS-T02N-SOL	SA	537270	S	X	X
GARDREF1-BNS-T02N-SOL	SA	537424	S	X	X
GARDREF1-LET-T02N-SOL	SA	537425	S	X	X
RIP-2-T01N-SOL	SA	537426	S	X	X
RIP-2-T02N-SOL	SA	537427	S	X	X
RIP-9-T01N-SOL	SA	537428	S	X	X
RIP-9-T02N-SOL	SA	537429	S	X	X
RIP-8-T01N-SOL	SA	537430	S	X	X
RIP-8-T02N-SOL	SA	537431	S	X	X
RIP-10-T01N-SOL	SA	537432	S	X	X
RIP-10-T02N-SOL	SA	537433	S	X	X
RIP-1-T01N-SOL	SA	537434	S	X	X
RIP-1-T02N-SOL	SA	537435	S	X	X
GARDREF2-BNS-T01N-SOL	SA	537932	S	X	X
GARDREF2-ZUC-T01N-SOL	SA	537933	S	X	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank HB = Holding Blank FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative or identified during the assessment process.

The sample results for conductivity originally provided in this data package were inadvertently adjusted for moisture content. The laboratory revised the results accordingly and resubmitted the Form Is.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Nitrate as N: Analyses were performed 7 to 13 days after sample collection. The QAPP holding time for a soil is 48 hours. Since the nitrate is likely to be stable at 4° C in soils, it was the judgment of the reviewer that nondetect results did not require rejection for the samples being analyzed after more than 2x the holding time limit. All positive and non-detect results for nitrate were therefore qualified as estimated (J/UJ with indeterminate bias).
Method Blanks	No	Various metals were detected in the metals preparation blank and continuing calibration blanks. Table 1.1 summarizes the metals blank detections and the resultant data qualifications (limited to those samples and analytes requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC • MS RIP-8-T01N-SOL • PDS • LD RIP-8-T01N-SOL	No	The matrix spike (MS) results for selected parameters exceeded the QC acceptance criteria. Chemicals with low recoveries (but >30% for inorganics) were qualified as estimated in the parent sample. Chemicals with very low recoveries <30% for inorganics) were qualified as estimated if detected, but rejected if not detected. Chemicals with high recoveries were qualified only if detected in the sample. The affected chemicals are summarized in Table 1.2. The ICP post-digestion spikes satisfied QC acceptance criteria. The lab duplicate results were within QC criteria for all analytes. The matrix quality control results for the vegetable garden sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment for the vegetable garden sampling event.
Method QC • Surrogates • Serial Dilution RIP-8-T01N-SOL • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was not applicable for eight metals out of 24. For the remaining metals, the percent difference between the original results and the results for a 5-fold dilution exceeded the ≤10% criterion for three metals. The affected analytes were qualified as estimated in the parent sample. Table 1.3 summarizes these results. The serial dilutions for the vegetable garden sampling event will be evaluated collectively and any additional data qualifications will be summarized in the overall assessment for the vegetable garden sampling event. Total vs. partial analyses were evaluated for TKN vs. ammonia. In all cases the TKN was greater than or equal to the ammonia analysis. Cation/Anion balance was not evaluated since it is not applicable for soils.
Field QC • Field Duplicate GARDEN3-BNS-T02N/D-SOL • Rinsate Blank • Field Blank • Trip Blank • Other (e.g. Splits)	Yes	Results for duplicate pair GARDEN3-BNS-T02N/D-SOL meet the QAPP precision criteria. Rinsate blanks, if any, were analyzed and reported with water samples, and will be evaluated at a later date. The field QC results for the vegetable garden sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment for the vegetable garden sampling event.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 10-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.

Review Parameter	Criteria Met?	Comments
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	In addition to sample specific parameters, laboratory performance parameters were reviewed for this package. The results of this evaluation are provided below.
Laboratory Performance Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration • Number/Conc. of points • Low standard vs. RL • Goodness of Fit • Analytical sequence	Yes	All initial calibrations met criteria.
Continuing Calibration Verification • Adequate frequency? • Adequate recovery?	Yes	All continuing calibrations met criteria.
Laboratory Control Sample Results • Second source? • Adequate recovery? • Replicate agreement?	No	The Laboratory Control Sample Duplicate (LCSD) recovery for ammonia-nitrogen was slightly below the QC acceptance criteria. Affected sample results were qualified as estimated. The affected samples are summarized in Table 1.4.
Compound Identification • RTs or RRTs • Second Column Conf. • Mass Spectrum	N/A	
Quantification • Were the proper internal standards and response factors used, as applicable? • Are reported sample results adjusted for? – DFs – Sample Size – Dry Weight • Agreement between replicate instrument measurements?	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated that the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification of Summary Form Data • CFs/RRFs calculated properly? • %Rs calculated properly? • %Ds calculated properly? • Transcription errors?	Yes	No comments.
Method Specific QC • Tuning • ICSA/AB • Thermal Stability • Spectral Resolution • Mass Calibration	No	Most samples contained concentrations of iron comparable to that in the interference check samples (ICSs). As such, it was necessary to evaluate any biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements). The results of this evaluation are summarized in Table 1.5.

Table 1.1
Metal Blank Detections and Qualifications

Analyte	CCBs (µg/L)	MB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Molybdenum (P)	1.3 (CCB4)		1.2	GARDREF2-BNS-T01N-SOL GARDREF2-ZUC-T01N-SOL	U CCB-I

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike/Matrix Spike Duplicate Results Exceeding Acceptance Criteria
(Conducted on sample RIP-8-T01N-SOL)

Analyte	MS % Rec	Lower QC Limit	Upper QC Limit	Qualification and Codes
Phosphorus	68.7	75	125	J MS – L
Antimony (total basis)	30.5	75	125	UJ MS – L

Table 1.3
Serial Dilution Results Exceeding Acceptance Criteria
(Conducted on samples RIP-8-T01N-SOL)

Analyte	RIP-8-T01N-SOL %D >10%	Qualification and Code
Nickel	20.0	J DL - L
Potassium	22.8	
Zinc	10.7	

Table 1.4
Laboratory Control Sample/ Laboratory Control
Sample Duplicate Exceeding Acceptance Criteria

Analyte	% Recovery	Lower QC Limit	Upper QC Limit	Samples Qualified	Qualification and Codes
Ammonia-nitrogen	82.4	85	115	RIP-10-T01N-SOL	J LCS – L
				GARDREF2-BNS-T01N-SOL	J LCS – L
				GARDREF2-ZUC-T01N-SOL	J LCS – L

Table 1.5
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Boron	12	6.4	RIP-2-T01N-SOL RIP-2-T02N-SOL RIP-8-T02N-SOL RIP-10-T01N-SOL RIP-10-T02N-SOL RIP-1-T01N-SOL RIP-1-T02N-SOL	J ICS – H
Molybdenum	-2	1.2	GARDREF2-BNS-T01N-SOL	UJ ICS – L
Silver	1	1.5	GARDEN1-LET-T01N-SOL GARDEN3-BNS-T02N-SOL GARDEN3-BNS-T02D-SOL GARDEN2-BNS-T02N-SOL RIP-9-T02N-SOL RIP-8-T01N-SOL RIP-8-T02N-SOL GARDREF2-BNS-T01N-SOL	J ICS – H

The interferent element iron was present in most samples at concentrations comparable to that in the interference check samples (ICSs). As such, affected samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute value of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25%of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: SOL085 Sampling Event: August 2003 RIP

Matrix: Solid __X_ Water ___ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 10/24/03

Peer Reviewer: Stacey Coker Date Completed: 10/28/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
RIP-3-T01N-SOL	SA	538113	S	X	X
RIP-3-T02N-SOL	SA	538114	S	X	X
RIP-6-T01N-SOL	SA	538115	S	X	X
RIP-6-T02N-SOL	SA	538116	S	X	X
RIP-7-T01N-SOL	SA	538117	S	X	X
RIP-7-T02N-SOL	SA	538118	S	X	X
RIP-4-T01N-SOL	SA	538119	S	X	X
RIP-4-T02N-SOL	SA	538120	S	X	X
RIP-5-T01N-SOL	SA	553121	S	X	X
RIP-5-T02N-SOL	SA	538122	S	X	X

Matrix: S = Soil

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 26 days beyond log-in. The pH for all samples was measured approximately four hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	Yes	Several analytes were detected in the metals method and continuing calibration blanks. Due to the fact that all of theses analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections, no qualification of data was necessary, with the exception of one beryllium result. Beryllium was detected in CCB2 (continuing calibration blank associated with sample RIP-4-T01N-SOL) at 0.5 µg/L. Taking into consideration the preparation mass and % solids for this sample, the adjusted blank concentration was calculated as 0.2 mg/kg. When this adjusted value is multiplied by five to determine the threshold value, the detected concentration of 0.64 mg/kg is less than 1.0 mg/kg thereby resulting in the qualification of the beryllium result for this sample as nondetect with an indeterminate bias direction assigned.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the August 2003 Riparian Soil sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RIP-3-T01N-SOL • Total vs. Partial Analyses	No	The internal standard recovery of ^{89}Y was high for the ICPMS analyses of samples RIP-6-T02N-SOL, RIP-7-T01N-SOL, RIP-7-T02N-SOL, RIP-5-T01N-SOL, and RIP-5-T02N-SOL. Accordingly, the molybdenum results, as verified by the run-logs, were reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. In addition, as mentioned in the laboratory case narrative, the internal standard recovery of ^{45}Sc exceeded control criteria for the ICPMS analysis of sample RIP-5-T02N-SOL. Accordingly, the aluminum, boron, chromium, selenium, vanadium, zinc, and calcium results, as verified by the run-logs, were reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. One serial dilution test was conducted on sample RIP-3-T01N-SOL. The serial dilution results could not be used to assess potential interferences for 12 of the 24 metal analytes, as only 12 analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. As all %Ds for applicable metal analytes were less than 10%, none of the results of this study could be used to evaluate the presence of physical or chemical matrix interferences.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	Yes	No field QC samples were analyzed with this package. The field QC results for the August 2003 Riparian Soil sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Nondetect Results w/ Elevated RLs?	Yes	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results Three samples contained the interferent element iron in "on-instrument" concentrations comparable to that in the interference check samples (ICSs). As such, it was necessary to evaluate these samples for any positive or negative biases suggested by the results from the ICS A analyses (ICS A only contains the interfering elements). The ICS A result for cadmium was greater than the IDL for all three samples, suggesting a potential high bias accounting for more than 25% of the associated sample results or reporting limits. Due to the fact that cadmium results for all three samples were nondetect, and a potential high bias was noted, no qualification of data was necessary. No other instances of ICS results with an absolute value in excess of the Method Detection Limit (MDL) were found.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Cond. (μmhos/cm)	pH (std units)
RIP-3-T01N-SOL	3350 J	7.3 J
RIP-3-T02N-SOL	658 J	7.7 J
RIP-6-T01N-SOL	286 J	8.2 J
RIP-6-T02N-SOL	337 J	8.2 J
RIP-7-T01N-SOL	146 J	8.7 J
RIP-7-T02N-SOL	82.5 J	8.9 J
RIP-4-T01N-SOL	4620 J	7.4 J
RIP-4-T02N-SOL	2010 J	8.5 J
RIP-5-T01N-SOL	187 J	8.7 J
RIP-5-T02N-SOL	155 J	8.8 J

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: SOL086 Sampling Event: August 2003 RIP

Matrix: Solid ___Water _X_Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 10/24/03

Peer Reviewer: Stacey Coker Date Completed: 10/28/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
RIP-11-T01N-SOL	SA	539452		S	X	X
RIP-11-T02N-SOL	SA	539453		S	X	X
RIP-12-T01N-SOL	SA	539454		S	X	X
RIP-12-T02N-SOL	SA	539455		S	X	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The chromatogram names in the total organic carbon sequence dated 09/09/03 were inadvertently one space removed from the instrument position after location number 83 due to a malfunction in the auto sampler. However, the acquisition time on the chromatograms reflected the correct sequence. No qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time was exceeded by 17 or 18 days for nitrate as N. Because nitrate is the stable form of oxidized nitrogen, the nitrate as N data are still considered useable as qualified despite the holding time being exceeded by more than two times the holding time criterion. The analysis for pH and conductivity were exceeded by 2 or 3 days and 18 or 19 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Arsenic, molybdenum, silver, and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the August 2003 Riparian Soil sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RIP-11-T01N-SOL • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis conducted on sample RIP-11-T01N-SOL was applicable for 13 out of 24 analytes. The percent difference between the original result and result for the diluted sample for nickel and potassium did not satisfy the ≤10% criterion and the results for this sample were qualified as estimated. Table 1.3 summarizes these results. The serial dilution results for each sampling event will be evaluated collectively and any resultant/additional data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were no field quality control samples in this package. The field quality control results for the August 2003 Riparian Soil sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Conductivity (umhos/cm)	pH
RIP-11-T01N-SOL	2.3 UJ	62.2 J	8.1 J
RIP-11-T02N-SOL	2.2 UJ	38.1J	8.0 J
RIP-12-T01N-SOL	4.9 J	60.0 J	7.4 J
RIP-12-T02N-SOL	3.2 J	45.7 J	7.7 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB4 (mg/kg)	CCB5 (mg/kg)	MB (mg/kg)	IDL	Samples qualified	Qualification Code
Arsenic (P) DF=1		0.32		2.4	RIP-11-T02N-SOL, RIP-12-T01N-SOL	U CCB-I
Molybdenum (P) DF=1	0.21			1.6	RIP-11-T01N-SOL, RIP-11-T02N-SOL, RIP-12-T01N-SOL	U CCB-I
Silver (P) DF=1			-0.229	0.9	RIP-11-T01N-SOL, RIP-11-T02N-SOL, RIP-12-T01N-SOL, RIP-12-T02N-SOL	UJ/J MB-L
Sodium (P) DF=1			36.99	218.8	RIP-11-T01N-SOL, RIP-11-T02N-SOL, RIP-12-T01N-SOL	U MB-I

P=ICP MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
For the sake of brevity the table is limited to those blank results that indicated qualification.
As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Action
RIP-11-T01N-SOL		
Nickel	10.9	Qualify parent sample J DL-L
Potassium	18.3	Qualify parent sample J DL-L

For the sake of brevity the table is limited to those serial dilution results that indicated qualification.
As such, zinc is not listed because 10.3% (which rounds to 10%) is within the serial dilution criterion.

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE FALL 2002 GROUNDWATER AND SURFACE WATER SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004 with August 2006 Revision

URS Corporation
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139919

TABLE OF CONTENTS

Section 1 Introduction 1-1

1.1 Sample Nomenclature Scheme 1-1
1.2 Samples Collected 1-2

Section 2 Matrix Related Analyses Issues 2-1

2.1 Sulfate Analyses 2-1
2.2 Fluoride Analyses 2-1
2.3 Metals Analyses 2-2

Section 3 Data validation Process 3-1

Section 4 Data validation Commentary 4-1

4.1 Data Validation Narratives 4-1
4.2 General Data Quality Issues 4-1
4.2.1 Holding Blanks 4-1
4.2.2 Manual Integration 4-1
4.2.3 Low-Level Detections 4-1
4.2.4 Tics Reported In Blanks 4-1
4.2.5 Dilution Schemes/Non-Detects With Elevated Rls 4-2
4.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 4-2
4.2.7 Non-Valid Matrix Spikes 4-2
4.2.8 Laboratory Performance Review (LPR) Findings 4-3

Section 5 Collective Summary/Assessment of Matrix QC Results 5-1

5.1 Matrix Spike Results (Accuracy Evaluation) 5-1
5.1.1 Groundwater Matrix Spike 5-3
5.1.2 Surface Water Matrix Spike 5-4
5.2 Laboratory Duplicates (Precision Evaluation) 5-5
5.2.1 Groundwater Laboratory Duplicate 5-7
5.2.2 Surface Water Laboratory Duplicate 5-7
5.3 Serial Dilution Results 5-8
5.3.1 Groundwater Serial Dilutions 5-9
5.3.2 Surface Water Serial Dilutions 5-10

Section 6 Collective Summary/Assessment of Field QC Results 6-1

6.1 Field Duplicate Samples 6-1
6.1.1 Groundwater Field Duplicate Results 6-2
6.1.2 Surface Water Field Duplicates Results 6-3
6.2 Rinsate Blank Results 6-3
6.2.1 Groundwater Rinsate Blanks 6-4

6.2.2 Surface Water Rinsate Blanks 6-6
6.3 Field Blank Results 6-7
6.3.1 Groundwater Field Blank Results 6-8
6.3.2 Surface Water Field Blank Results 6-8

Section 7 Overall Data Quality Indicator Assessment 7-1

7.1 Precision 7-1
7.2 Accuracy 7-1
7.3 Completeness 7-2
7.4 Representativeness 7-2
7.5 Comparability 7-2
7.6 Sensitivity 7-3

List of Attachments

Attachment 1.1 Data Package WAT001
Attachment 1.2 Data Package WAT002
Attachment 1.3 Data Package WAT003
Attachment 1.4 Data Package WAT004
Attachment 1.5 Data Package WAT005
Attachment 1.6 Data Package WAT006
Attachment 1.7 Data Package WAT007
Attachment 1.8 Data Package WAT008
Attachment 1.9 Data Package WAT009
Attachment 1.10 Data Package WAT010
Attachment 1.11 Data Package WAT011
Attachment 1.12 Data Package WAT012
Attachment 1.13 Data Package WAT013
Attachment 1.14 Data Package WAT014
Attachment 1.15 Data Package WAT015
Attachment 1.16 Data Package WAT016
Attachment 1.17 Data Package WAT017
Attachment 1.18 Data Package WAT018
Attachment 1.19 Data Package WAT019
Attachment 1.20 Data Package WAT020

TABLE OF CONTENTS

Attachment 1.21	Data Package WAT021
Attachment 1.22	Data Package WAT022
Attachment 1.23	Data Package WAT023
Attachment 1.24	Data Package WAT024
Attachment 1.25	Data Package WAT025
Attachment 1.26	Data Package WAT026
Attachment 1.27	Data Package WAT027
Attachment 1.28	Data Package WATRAA1
Attachment 1.29	Data Package WATRAA2
Attachment 1.30	Data Package WATRAF1
Attachment 1.31	Data Package WATRABC1

This data validation report is intended to provide the reader with a general overview of the usability of chemical data obtained from the Remedial Investigation/Feasibility Study (RI/FS) sampling activities at Molycorp. In addition, this data validation report is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

This report contains the results of the data validation conducted for groundwater and surface water samples collected in the Fall of 2002 at the Molycorp Questa Mine, Questa, New Mexico. These water samples were collected in support of the RI/FS. The water samples were sent to Severn Trent Laboratories (STL) Burlington in Colchester, VT. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods used and quality control samples collected were in accordance with the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). The results were reported in 27 original and 4 re-analyses data packages. The table below presents a summary of the number of field and quality control samples collected for each analysis type.

Total Water Samples Collected During Fall, 2002

Sample Type	Total Metals	Dissolved Metals	Inorganics	VOCs	SVOCs	Explosives
Groundwater	108	108	108	25	25	49
GRW MS/MSD	8	8	8	2	2	7
GRW Field Duplicate	7	7	7	2	2	4
GRW Rinsate Blank	7	7	7	2	2	3
GRW Field Blank	NA	NA	NA	2	2	3
Surface Water	58	58	58	16	16	16
SFW MS/MSD	3	3	3	1	1	1
SFW Field Duplicate	3	3	3	1	1	1
SFW Rinsate Blank	3	3	3	1	1	1
SFW Field Blank	NA	NA	NA	1	1	1

GRW = suffix indicating groundwater sample SFW = suffice indicating surface water sample

MS/MSD = Matrix Spike/Matrix Spike Duplicate for organics or MS/LD for inorganics

NA = Not Applicable

The QAPP required that the quality control samples listed above be collected at a frequency of 5%. As illustrated by the table, the frequency of QC samples collected was satisfied for each analysis type.

1.1 SAMPLE NOMENCLATURE SCHEME

The sample identification (ID) numbers were generally comprised of the five components discussed below. This sample nomenclature scheme was adopted for its consistency with the historical data contained in the database.

Component 1	Component 2	Component 3	Component 4	Component 5
Location or Station Number	Sample Fraction (T or D)	Sequence Number	Sample Type	Matrix Code

Component 1: The location/station ID codes are given in Tables 2-1 through 2-6 and 2-9 of the FSP contained in Volume 4 of the RI/FS Work Plan.

Component 2: Component 2 consists of one character, either "T" or "D", designating the sample fraction. A "T" is used to indicate a total fraction (i.e., unfiltered sample) and a "D" is used to indicate a dissolved fraction (i.e. filtered with a 0.45 micron filter).

Component 3: Component 3 consists of a two-character code indicating the sequence number of the sample when multiple samples (i.e., various depth samples) are collected at the same location.

Component 4: Component 4 consists of a one-character code indication the sample type. A code of "N" is used for a normal environmental sample. A code of "D" is used for a field duplicate sample.

Component 5: Component 5 consists of a three-character code indicating the sample matrix as samples of multiple media may be collected from one location or station. For aqueous samples, the following matrix codes were used:

GRW = Groundwater

SFW = Surface Water

1.2 SAMPLES COLLECTED

The groundwater and surface water samples collected and their associated chemical analyses are provided in the tables below.

Field Identification of Groundwater Samples Collected During Fall, 2002

Field ID	Dissolved Metals	Total Metals	Inorganics	VOCs	SVOCs	Explosives
MMW-2-T01N-GRW	x	x	x			
MMW-3-T01N-GRW	x,RB	x,RB	x,RB			
MMW-23A-T01N-GRW	x	x	x			
MMW-23B-T01N-GRW	x	x	x			
MMW-42A-T01N-GRW	x	x	x			
MMW-42B-T01N-GRW	x	x,SD	x			
SPRING13-T01N-GRW	x	x	x			
LOWERSPRING13-T01N-GRW	x	x	x			
SRING14-T01N-GRW	x	x	x			
CAPULIN1-T01N-GRW	x	x	x			
MMW-34B-T01N-GRW	x	x	x	x	x	x
MMW-35B-T01N-GRW	x	x	x	x	x	x
MMW-40A-T01N-GRW	x	x	x	x	x	x
MINE1-T01N-GRW	x	x	x	x	x	x
GOATHILL SPRING-T01N-GRW	x	x	x			
MMW-10A-T01N-GRW	x	x	x			x
MMW-10B-T01N-GRW	x	x	x			x
MMW-10C-T01N-GRW	x	x	x			x
MMW-11A-T01N-GRW	x,FD	x,FD	x,FD			x
MMW-11-T01N-GRW	x,MS,LD, SD,RB	x,MS,LD, SD,RB	x,MS,LD,RB			x,MS/MSD,RB
MMW-13-T01N-GRW	x	x	x			x

Field ID	Dissolved Metals	Total Metals	Inorganics	VOCs	SVOCs	Explosives
MMW-19B-T01N-GRW	x	x	x			x
MMW-24-T01N-GRW	x	x	x			x
MMW-25B-T01N-GRW	x	x	x			x
MMW-29A-T01N-GRW	x	x	x			x
MMW-29B-T01N-GRW	x	x	x			x
MMW-30A-T01N-GRW	x	x	x			x
MMW-30B-T01N-GRW	x	x	x			x
MMW-31A-T01N-GRW	x,MS,LD, SD,FD	x,MS,LD, SD,FD	x,MS,LD,FD			x,MS/MSD
MMW-31B-T01N-GRW	x	x	x			x
MMW-32A-T01N-GRW	x,MS,LD,SD	x,MS,LD,SD	x,MS,LD			x,MS/MSD
MMW-32B-T01N-GRW	x,MS,LD,SD	x,MS,LD,SD	x,MS,LD			x,MS/MSD
MMW-33A-T01N-GRW	x	x	x			x
MMW-38A-T01N-GRW	x	x	x			x
MMW-39A-T01N-GRW	x	x	x	x	x	x
P-3-T01N-GRW	x	x	x			x
P-4B-T01N-GRW	x	x	x			x
P-5B-T01N-GRW	x	x	x			x
P-5C-T01N-GRW	x	x	x			x
COMPANY CABINS-T01N-GRW	x,RB	x,RB	x,RB			X,RB
DOUGLAS WELL-T01N-GRW	x, FD	x, FD	x, FD			X, FD
FAGERQUIST WELL-T01N-GRW	x	x	x			x
COLUMBINE CG WELL-T01N-GRW	x	x	x			x
COLUMBINE CG WELL2-T01N-GRW	x	x	x			NS
MMW-7-T01N-GRW	x,FD	x,FD	x,FD	x,FD	x,FD	x,FD
MMW-8A-T01N-GRW	x,MS,LD, SD,RB,FB	x,MS,LD, SD,RB,FB	x,MS,LD, RB,FB	x,MS/MSD, RB,FB	x,MS/MSD, RB,FB	x,MS/MSD, RB,FB
MMW-8B-T01N-GRW	x,FD	x,FD	x,FD	x,FD	x,FD	x,FD
MMW-21-T01N-GRW	x	x	x	x,FB	x,FB	x,FB
MMW-22-T01N-GRW	x	x	x	x	x	x
MMW-36B-T01N-GRW	x	x	x	x	x	x
MMW-44A-T01N-GRW	x	x	x	x	x	x
MMW-44B-T01N-GRW	x	x,SD	x	x	x	x
MMW-47A-T01N-GRW	x,RB	x,RB	x,RB	x,RB	x,RB	x,RB
P-1-T01N-GRW	x	x	x	x	x	x
P-2-T01N-GRW	x,MS,LD,SD	x,MS,LD,SD	x,MS,LD	x,MS/MSD	x,MS/MSD	x,MS/MSD
COLUMBINE WELL NO 1-T01N-GRW	x	x	x	X	x	x
COLUMBINE WELL NO 2-T01N-GRW	x	x	x	X	x	x
US-1-TOIN-GRW	x,RB	x,RB	x,RB			
US-2-T01N-GRW	x	x	x			
US-3-T01N-GRW	x	x	x			
SPRING39-T01N-GRW	x	x	x			
MMW-48A-T01N-GRW	x	x	x	X	x	x
MMW-28A-T01N-GRW	x	x	x	x,RB	x	
MMW-28B-T01N-GRW	x	x	x	X	x	
MMW-43A-T01N-GRW	x	x	x	X	x	
LAB WELL-T01N-GRW	x	x	x	X	x	
MMW-17A-T01N-GRW	x,MS,LD,SD	x,MS,LD,SD	x,MS,LD			x,MS/MSD
MMW-17B-T01N-GRW	x,MS,LD,SD	x,MS,LD,SD	x,MS,LD			

Field ID	Dissolved Metals	Total Metals	Inorganics	VOCs	SVOCs	Explosives
LS-1-T0IN-GRW	x	x	x			
LS-2-T01N-GRW	x	x	x			
LS-3-T01N-GRW	x	x	x			
EW-5A-T01N-GRW	x	x	x			
EW-5B-T01N-GRW	x	x	x			
EW-5D-T01N-GRW	x	x	x			
EW-1-T01N-GRW	x	x,SD	x			
EW-2-T01N-GRW	x	x	x			
EW-3-T01N-GRW	x	x	x			
EW-4-T01N-GRW	x	x	x			
EW-6 (MW-3)-T01N-GRW	x	x	x			
MW-1-T01N-GRW	x	x	x			
MW-2-T01N-GRW	x	x	x			
MW-4-T01N-GRW	x,RB	x,RB	x,RB			
MW-7A-T01N-GRW	x,FD	x,FD,SD	x,FD			
MW-7C-T01N-GRW	x	x	x			
MW-9A-T01N-GRW	x	x	x			
MW-10-T01N-GRW	x	x	x			
MW-11-T01N-GRW	x	x	x			
MW-12-T01N-GRW	x	x	x			
MW-13-T01N-GRW	x	x	x			
MW-14-T01N-GRW	x	x	x			
MW-15-T01N-GRW	x	x	x			
MW-A-T01N-GRW	x	x	x			
MW-B-T01N-GRW	x	x	x			
MW-CH-T01N-GRW	x	x	x	x	x	
MW-17-T01N-GRW	x	x	x	x	x	
MW-23-T01N-GRW	x	x	x			
MW-24 -T01N-GRW	x	x	x			
OUTFALL002-T01N-GRW	x	x	x			
DECANT-T01N-GRW	x	x	x	**Diesel Range Organics[2] (this sample only)**		
SPRING 9-T01N-GRW	x	x	x			
SPRING 10-T01N-GRW	x	x	x			
SPRING 12-T01N-GRW	x	x	x			
SPRING 14-T01N-GRW	x	x	x			
SPRING 15-T01N-GRW	x	x	x			
SPRING 17-T01N-GRW	x	x	x			
SPRING 18-T01N-GRW	x	x	x			
MMW-18B-T01N-GRW	x	x	x			x
MMW-19A-T01N-GRW	x	x	x			x

NS = Not Sampled FB = Field Blank MS/MSD = Matrix Spike/Matrix Spike Duplicate

RB = Rinsate Blank FD = Field Duplicate LD = Laboratory Duplicate SD = Serial Dilution

Notes:

1. For the dissolved metals samples, the “T01N” component of the field ID was replaced with “D01N”.
2. DECANT-T01N-GRW was analyzed for Diesel Range Organics only, no VOC or SVOC analyses were performed on this sample.

Field Identification of Surface Water Samples Collected During Fall, 2002

Field ID	Total Metals	Dissolved Metals	Inorganics	VOCs	SVOCs	Explosives
CAPULIN1-T01N-SFW	x	x	x			
ZWERGEL-T01N-SFW	x	x	x	x	x	x
RR-1-T01N-SFW	x	x	x			
RR-3-T01N-SFW	x	x	x			
RR-4-T01N-SFW	x	x	x	x	x	x
RR-5-T01N-SFW	x,SD	x	x	x, FB	x, FB	x, FB
RR-6-T01N-SFW	x,MS,LD,SD	x,MS,LD,SD	x,MS,LD	x,MS/MSD	x,MS/MSD	x,MS/MSD
RR-6A-T01N-SFW	x	x	x	x	x	x
RRS-9-T01N-SFW	x, RB,MS, LD,SD	x, RB,MS, LD,SD	x, RB,MS,LD			
RRS-12-T01N-SFW	x	x	x			
RRS-13-T01N-SFW	x	x	x			
RRS-15-T01N-SFW	x	x	x			
RRS-17-T01N-SFW	x,FD	x,FD	x,FD			
RRS-20-T01N-SFW	x	x	x			
RRS-24-T01N-SFW	x	x	x			
RRS-27-T01N-SFW	x	x	x			
RR-7-T01N-SFW	x	x	x	x	x	x
RR-8-T01N-SFW	x	x	x	x	x	x
RR-8A-T01N-SFW	x	x	x			
RR-10-T01N-SFW	x	x	x			
RR-10A1-T01N-SFW	x	x	x			
RR-11A1-T01N-SFW	x	x	x	x	x	x
RR-11B-T01N-SFW	x	x	x			
RR-11C-T01N-SFW	x	x	x			
RR-12-T01N-SFW	x	x,SD	x	x	x	x
RR-13-T01N-SFW	x	x	x			
RR-14-T01N-SFW	x	x	x			
RR-15-T01N-SFW	x	x	x	x	x	x
RR-16-T01N-SFW	x	x	x			
RR-17-T01N-SFW	x	x	x			
RR-18A-T01N-SFW	x	x	x			
RR-18B-T01N-SFW	x,SD	x	x			
RR-20-T01N-SFW	x	x	x	x	x	x
LR-1-T01N-SFW	x	x	x	x	x	x
LR-4-T01N-SFW	x	x	x			
LR-5-T01N-SFW	x	x	x			
LR-8A-T01N-SFW	x, FD	x, FD	x, FD	x, FD	x, FD	x, FD
LR-11A-T01N-SFW	x,SD	x	x			
LR-13-T01N-SFW	x	x	x			
LR-16-T01N-SFW	x	x	x	x	x	x
UFLIN-T01N-SFW	x	x	x			
UFLOUT-T01N-SFW	x	x	x			
UFLMID-T01N-SFW	x	x	x	x	x	x
ERLIN-T01N-SFW	x,MS,LD,SD	x,MS,LD,SD	x,MS,LD			
ERLOUT-T01N-SFW	x,RB,FD	x,RB,FD	x,RB,FD			
ERLMID-T01N-SFW	x	x	x	x	x	x
ND-1-T01N-SFW	x,RB	x,RB	x,RB			

Field ID	Total Metals	Dissolved Metals	Inorganics	VOCs	SVOCs	Explosives
CD-1-T01N-SFW	x	x	x			
SW12-1-T01N-SFW	x	x	x			
SW12-2-T01N-SFW	x	x	x			
SW12-3-T01N-SFW	x	x	x			
SW12-4-T01N-SFW	x,SD	x	x			
SW12-5-T01N-SFW	x	x	x			
SW12-6-T01N-SFW	x	x	x			
SW12-7-T01N-SFW	x	x	x			
SW12-8-T01N-SFW	x	x	x			
SW12-9-T01N-SFW	x	x	x			
SW12-10-T01N-SFW	x	x	x			

NS = Not Sampled FB = Field Blank MS/MSD = Matrix Spike/Matrix Spike Duplicate

RB = Rinsate Blank FD = Field Duplicate LD = Laboratory Duplicate SD = Serial Dilution

Notes:

1. For the dissolved metals samples, the “T01N” component of the field ID was replaced with “D01N”.

During review of the Fall 2002 groundwater and surface water data, it became apparent that there were matrix-related analysis problems. The serial dilution results, comparisons with historical results, and charge balances suggested that matrix-related issues existed for the metals analysis, sulfate analysis, and fluoride analysis. The laboratory conducted several studies in order to determine analysis solutions to the matrix related analysis problems. Each analysis problem, investigation, and solution is summarized below.

2.1 SULFATE ANALYSES

The sulfate analyses were originally conducted by Ion Chromatography by Method 300.0. For the Fall 2002 groundwater data, charge balances were often out of Standard Operating Procedures (SOP) 12.1 limits for samples with low pHs. For most of these, the sulfate results were often greater than the reported Total Dissolved Solids (TDS) results. Additionally, many sulfate results were higher than historic results. In order to investigate the analysis issues, the laboratory conducted several re-analyses on a selected variety of samples encompassing a range of pHs. After noting reproducibility and comparability problems despite analyzing filtered and unfiltered samples, homogenized and non-homogenized (un-mixed) samples, the same sample over five days, and using an eluent dilution technique, a different method was examined.

The selected group of samples were analyzed by a turbidimetric technique using Environmental Protection Agency (EPA) Method 375.4. The charge balances using the turbidimetric method were within acceptance limits. In addition, a five-day reproducibility study indicated that the turbidimetric analysis method indicated acceptable analytical precision. Thus, all Fall and December 2002 groundwater samples for which the charge balances were outside of acceptance limits were reanalyzed for sulfate using EPA Method 375.4. In addition, all subsequent sulfate analyses were conducted using method EPA 375.4.

2.2 FLUORIDE ANALYSES

When comparing results for the Fall 2002 groundwater data with historic results, it was noted that many fluoride results were lower than historic results. The problem was traced to the concentration of aluminum present in the samples which complexes with the fluoride and results in suppressed measurements. Fluoride was determined using Method 340.2 which includes the addition of a chelating buffer to alleviate interferences from polyvalent cations such as fluoride. However, the method can only compensate for aluminum concentrations up to 3 mg/l. Approximately 50 samples contained aluminum at concentrations greater than 3 mg/l.

To correct the problem, the laboratory reanalyzed the samples by performing the dilutions necessary to reduce the aluminum concentration to 3 mg/l or less prior to the addition of the chelating buffer. Results obtained using this procedure were comparable with historic data. Thus, all Fall and December 2002 groundwater samples for which the aluminum concentrations were greater than 3 mg/l were reanalyzed. In addition, for all subsequent fluoride analyses, the laboratory diluted the samples based on the aluminum concentration, prior to addition of the chelating buffer.

2.3 METALS ANALYSES

Some metal results were inconsistent with historic results. Many serial dilution results differed by more than 10% for a 5-fold dilution. Additionally, for many samples in which the charge balance was outside the acceptance limits, the cation results appeared to be low. It was observed that the number of metals failing to meet the acceptance criterion tended to increase as the pH of the samples decreased. To study these observations, seven samples encompassing a range of pHs were selected for analysis at multiple dilutions (generally four different dilutions). Post-digestion spikes were conducted at two of the dilution levels to evaluate at what dilution levels the interference problems appeared to be minimized.

The tables below present the dilution schemes for low pH and moderate pH samples that resulted from the dilution studies. Challenges in implementing the dilution schemes were achieving low detection limits for non-detects and complication of field logistics due to the need to arrange samples by pH group. These problems were most notable for samples with lower pHs (<6.70). The bias was corrected by dilution.

Analyses Strategy for Lower pH Samples

Analyte	pH Class A (pH < 5.6)	Dilution Adjusted IDL, ug/l	Lowest Evaluation Criterion, ug/l	QAPP RL (ug/L)	ICP	ICPMS
Al	ICP analysis at 100x dilution	2,260	87	40	22.6	5.3
Sb	ICP analysis at 10x dilution	50	1.5	0.7	5	0.3
As	ICP analysis at 10x dilution	67	50 (0.018)	2	6.7	0.2
B	ICP analysis at 10x dilution	27	330	160	2.7	
Ba	ICP analysis at 10x dilution	84	260	130	8.4	0.5
Be	ICP analysis at 10x dilution	3	5.3	2	0.3	0.1
Cd	ICP analysis at 100x dilution	80	0.25	0.9	0.8	0.1
Ca	ICP analysis at 100x dilution	23,400	--	200	234	17.4
Co	ICP analysis at 100x dilution	230	50	10	2.3	0.1
Cr	ICP analysis at 100x dilution	370	11	5	3.7	0.1
Cu	ICP analysis at 100x dilution	170	8.6	4	1.7	0.3
Pb	ICPMS analysis at 10x dilution	1	2.5	1	1.7	0.1
Fe	ICP analysis at 100x dilution	4,890	1,000	500	48.9	5.5
Mg	ICP analysis at 100x dilution	26,940	--	200	269.4	5.2
Mn	ICP analysis at 100x dilution	280	120	60	2.8	0.1
Ni	ICP analysis at 100x dilution	340	52	20	3.4	0.3
Mo	ICP analysis at 10x dilution	17	18	3	1.7	0.2
Ag	ICPMS analysis at 10x dilution	16	2.9	1	1.6	0.1
Tl	ICPMS analysis at 10x dilution	29	0.26	0.1	2.9	0.1
K	ICP analysis at 100x dilution	31,410	--	200	314.1	
Se	ICPMS analysis at 10x dilution	8	5	2	2.8	0.8
V	ICPMS analysis at 10x dilution	2	--	10	1.8	0.2
Na	ICP analysis at 100x dilution	36,560	--	200	365.6	
Zn	ICP analysis at 100x dilution	390	115	50	3.9	0.5
	QAPP Table acknowledged that criteria below 50 ug/l would not be met by conventional methods.					

Analyses Strategy for Moderate pH Samples

Analyte	pH Class B (5.6<pH<6.7) pH Class C (pH > 6.7)	Dilution Adjusted IDL, ug/l	Lowest Evaluation Criterion, ug/l	QAPP RL (ug/L)	ICP	ICPMS
Al	ICP analysis at 10x dilution	226	87	40	22.6	5.3
Sb	ICPMS analysis at 2x dilution	0.6	1.5	0.7	5	0.3
As	ICPMS analysis at 2x dilution	0.4	50 (0.018)	2	6.7	0.2
B	ICP analysis straight	2.7	330	160	2.7	
Ba	ICP analysis straight	8.4	260	130	8.4	0.5
Be	ICP analysis straight	0.3	5.3	2	0.3	0.1
Cd	ICP analysis straight	0.8	0.25	0.9	0.8	0.1
Ca	ICP analysis at 10x dilution	2,340	--	200	234	17.4
Co	ICP analysis straight	2.3	50	10	2.3	0.1
Cr	ICP analysis straight	3.7	11	5	3.7	0.1
Cu	ICP analysis straight	1.7	8.6	4	1.7	0.3
Pb	ICPMS analysis at 2x dilution	0.2	2.5	1	1.7	0.1
Fe	ICP analysis at 10x dilution	489	1,000	500	48.9	5.5
Mg	ICP analysis at 10x dilution	2,694	--	200	269.4	5.2
Mn	ICP analysis at 10x dilution	28	120	60	2.8	0.1
Ni	ICP analysis straight	3.4	52	20	3.4	0.3
Mo	ICP analysis straight	1.7	18	3	1.7	0.2
Ag	ICPMS analysis at 2x dilution	0.2	2.9	1	1.6	0.1
Tl	ICPMS analysis at 2x dilution	0.2	0.26	0.1	2.9	0.1
K	ICP analysis straight	314.1	--	200	314.1	
Se	ICPMS analysis at 2x dilution	1.6	5	2	2.8	0.8
V	ICPMS analysis at 2x dilution	0.4	--	10	1.8	0.2
Na	ICP analysis at 10x dilution	3,656	--	200	365.6	
Zn	ICP analysis at 10x dilution	39	115	50	3.9	0.5
	QAPP Table acknowledged that criteria below 50 ug/l would not be met by conventional methods.					

The Fall 2002 groundwater and surface water samples for which the cation/anion balance was out of limits or the metals concentrations did not compare well with historic results were reanalyzed for dissolved metals using the applicable dilution scheme.

A summary of the Fall 2002 groundwater and surface water samples which were re-analyzed is provided in the following table. The table includes a listing of the data package in which the original results were reported and the data package in which the reanalysis results are reported.

Re-analyses Summary for Water Samples Collected During Fall, 2002

Site ID	pH	Units	Sample Round	Field QC ID	pH Category	Metals	Sulfate	Fluoride	Original SDG
Capulin Spring	2.9	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT006
Capulin1	3	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT008
Columbine No. 1	5.2	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT023
Columbine No. 2	5.5	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT024
Douglas Well	5	SU	0210	FD	A	WATRAA1	WATRAA1	WATRAA1	WAT026
Douglas Well	5	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT025
Goathill Spring	2.8	SU	0210	SA	A	WATRAA2		WATRAF1	WAT007
Lower Spring 13	3.6	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT010
MMW-10A	4.2	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT020
MMW-10C	4.7	SU	0210	SA	A	WATRAA2		WATRAF1	WAT019

Site ID	pH	Units	Sample Round	Field QC ID	pH Category	Metals	Sulfate	Fluoride	Original SDG
MMW-11	5.6	SU	0210	SA	A	WATRAA2		WATRAF1	WAT019
MMW-11A	4.2	SU	0210	FD	A	WATRAA1	WATRAA1	WATRAA1	WAT019
MMW-11A	4.2	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT019
MMW-17A	4.6	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAF1	WAT020
MMW-17B	4.4	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAF1	WAT016
MMW-19A	4.1	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT018
MMW-19A	4.1	SU	0210	FD	A	WATRAA1	WATRAA1	WATRAA1	WAT018
MMW-2	5.2	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT022
MMW-21	3.3	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT020
MMW-22	3.6	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT020
MMW-23A	5.3	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT016
MMW-24	4.6	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT018
MMW-28B	4.5	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT020
MMW-29A	4.6	SU	0210	SA	A	WATRAA2		WATRAF1	WAT019
MMW-30A	5.3	SU	0210	SA	A	WATRAA2		WATRAF1	WAT019
MMW-31A	4.2	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT018
MMW-31A	4.2	SU	0210	FD	A	WATRAA1	WATRAA1	WATRAA1	WAT018
MMW-32A	4.3	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT019
MMW-33A	4.3	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT021
MMW-34B	4.6	SU	0210	SA	A			WATRAF1	WAT017
MMW-36B	4.1	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT017
MMW-38A	2.9	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT026
MMW-39A	4.2	SU	0210	SA	A	WATRAA2		WATRAF1	WAT026
MMW-42A	3.2	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT026
MMW-44A	3.9	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT026
MMW-47A	4.8	SU	0210	SA	A	WATRAA2		WATRAF1	WAT023
MMW-7	4.2	SU	0210	FD	A	WATRAA1	WATRAA1	WATRAA1	WAT020
MMW-7	4.2	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT020
P-1	4.5	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT021
P-2	4.3	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT020
P-3	4.7	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT019
P-4B	4.5	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT026
P-5B	4.3	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT021
P-5C	4.3	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT021
Spring 13	3.9	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT003
Spring 14-M	4.8	SU	0210	SA	A	WATRAA1	WATRAA1	WATRAA1	WAT024
Spring 39	4.7	SU	0210	SA	A	WATRAA2		WATRAF1	WAT008
MMW-10B	6	SU	0210	SA	B	WATRABC1	WATRABC1	WATRABC1	WAT020
MMW-28A	5.9	SU	0210	SA	B	WATRABC1	WATRABC1		WAT020
MMW-40A	6.5	SU	0210	SA	B			WATRAF1	WAT025
MMW-48A	6.2	SU	0210	SA	B			WATRAF1	WAT027
MMW-8B	5.7	SU	0210	FD	B			WATRAF1	WAT018
MMW-8B	5.7	SU	0210	SA	B			WATRAF1	WAT017
US-2	6.3	SU	0210	SA	B	WATRABC1	WATRABC1		WAT024
EW-5B	7.2	SU	0210	SA	C	WATRABC1	WATRABC1		WAT025
MMW-19B	7	SU	0210	SA	C			WATRAF1	WAT022
MMW-25B	6.9	SU	0210	SA	C			WATRAF1	WAT018
MMW-31B	6.9	SU	0210	SA	C			WATRAF1	WAT022
MW-15	7.1	SU	0210	SA	C	WATRABC1	WATRABC1		WAT014

Site ID	pH	Units	Sample Round	Field QC ID	pH Category	Metals	Sulfate	Fluoride	Original SDG
MW-4	7.9	SU	0210	SA	C	WATRABC1	WATRABC1		WAT015
MW-B	8.3	SU	0210	SA	C	WATRABC1	WATRABC1		WAT014
US-1	6.7	SU	0210	SA	C	WATRABC1	WATRABC1		WAT025

The re-analyses for metals was limited to the dissolved metals fraction only. As such, for samples in which the dissolved fraction was re-analyzed, the total metal sample results were rejected because they were not analyzed in accordance with the dilution schemes that resulted from the studies. The reason and bias codes assigned to the total metals results for the four samples listed in the table are “DL, Hist - L”. The “DL” reason code was used because it was the serial dilution results that suggested that pH-dependent matrix-related analysis problems existed. The “Hist” reason code was added to indicate that results obtained did not compare well with historic data, which further supported the presence of an analysis problem as implied by the serial dilution results.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, Inductively Coupled Plasma Spectroscopy (ICP) serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1, and is as follows: If no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used. If no criteria are specified in the SOP or the QAPP then the method-specified acceptance limits were used. If no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

In all cases of professional judgement exercised in evaluating the need for qualification, the basis for the professional judgement used is provided in the data validation narrative. Section 4 and Attachment 1 provide the data validation narratives for each of the data packages.

The site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. As outlined in Section 2, many samples were re-analyzed for Metals, Sulfates and Fluorides due to matrix conditions unique to the Molycorp Site. The additional qualifiers pertaining to affected sample results supercede those which were initially applied. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was

judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Where applicable, the potential direction of bias (high, low, or indeterminate) has been indicated on the tables in the text, and noted on the sample results sheets as H, L, or I, respectively. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 6.0.

4.1 DATA VALIDATION NARRATIVES

Attachment 1 includes all individual data validation summaries for data packages WAT001 through WAT027, for a total of 27 original data packages and four reanalysis packages. In order to attain the frequency requirements for laboratory performance reviews, a total of three data packages, WAT003, WAT016 and WAT020, were evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data validation summary reports. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

4.2 GENERAL DATA QUALITY ISSUES

During the data validation process, several data quality issues were evaluated to identified whether findings globally affect all relevant water samples analyzed for the May 2003 Groundwater and Surface Water Sampling Event. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

4.2.1 Holding Blanks

For the analysis of the volatile organic samples, a holding blank was carried through the sample storage period and analyzed in the same sequence as the samples in the data package. As all holding blank recoveries were all nondetect, the indication of the occurrence of potential cross-contamination during sample storage was unlikely.

4.2.2 Manual Integration

Manual integration was employed in deriving results for the volatile and semivolatile organics in a few data packages. The values that were derived from manual integration were qualified on the quantitation reports and extracted ion current profiles were included for each instance. The supporting documentation provided was reviewed and found to be adequate.

4.2.3 Low-level Detections

Detected organic analytes with concentrations between the Method Detection Limit (MDL) and the Reporting Limit (RL) were qualified as estimated (J). A qualifier code of “SQL-I” (Sample Quantitation Limit) was assigned to reflect the greater uncertainty in quantitative values below the RL.

4.2.4 TICs Reported in Blanks

Several Tentatively Identified Compounds (TICs) were reported as present in the semivolatile blanks for each package. The unknown compounds detected in the method blank were qualified as (NJ) to denote the analyses indicated the presence of an analyte that had been “tentatively identified” and the associated numerical value represented its approximate value. However, if similar TICs were present in the associated samples, the results were not considered to be

reportable due to laboratory contamination (as indicated by the blank) and therefore, flagged as unusable (R). After evaluating sample TICs based on laboratory method blanks, any remaining TICs were qualified as "NJ."

4.2.5 Dilution Schemes/Non-Detects With Elevated RLs

As discussed in Section 2, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

4.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilbria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

4.2.7 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

4.2.8 Laboratory Performance Review (LPR) Findings

As mentioned previously, three data packages were given a full validation to assess the performance of the laboratory for all analyses. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated for all packages for this event included:

- Initial Calibration for all SVOCs
- Initial/Continuing Calibration Verification for all SVOCs and metals
- Laboratory Control Sample Results for all packages containing explosives data

The site-specific Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, laboratory duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three sections present a discussion on the MS/MSD analyses, LD analyses, and the serial dilution results for the groundwater and surface water samples collected during the Fall 2002 sampling event.

5.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Aliquots of 8 groundwater and 3 surface water samples were submitted for use in matrix QC analyses. The table below summarizes the site-samples that were used to prepare matrix spike and matrix spike duplicate samples.

Field Samples Analyzed for Matrix Spike/Matrix Spike Duplicates

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
MMW-17B-T/D01N-GRW	Groundwater	WAT016	[6]	x[1]	x[5]			
MMW-8A-T/D01N-GRW	Groundwater	WAT017	x	x	x	x	x	x
MMW-31A-T/D01N-GRW	Groundwater	WAT018	[6]	x[1]	x[4]			x
MMW-32A-T/D01N-GRW	Groundwater	WAT019	[6]	x[1]	x[4]			x
MMW-11-T/D01N-GRW	Groundwater	WAT019	[6]	x[2]	x[3]			x
MMW-17A-T/D01N-GRW	Groundwater	WAT020	[6]	x[1]	x[5]			x
P-2-T/D01N-GRW	Groundwater	WAT020	[6]	x[1]	x[4]	x	x	x
MMW-32B-T/D01N-GRW	Groundwater	WAT022	x	x	x			x
RR-6-T/D01N-SFW	Surface Water	WAT006	x	x	x	x	x	x
ERLIN-T/D01N-SFW	Surface Water	WAT007	x	x	x			
RRS-9-T/D01N-SFW	Surface Water	WAT008	x	x	x			

For Metals and Inorganic analyses, a single matrix spike sample was analyzed.

For Organic analyses, duplicate matrix spike samples were analyzed.

[1] Reported in reanalysis package WATRAA1.

[2] Reported in reanalysis package WATRAA2.

[3] Fluoride only reported in reanalysis package WATRAF1.

[4] Fluoride and sulfate only reported in reanalysis package WATRAA1.

[5] Fluoride and sulfate only reported in reanalysis packages WATRAF1 and WATRAA1, respectively.

[6] These class A total metals samples were not reanalyzed; as the total metals results for these samples were rejected, the matrix spike analyses could not be considered valid and usable for evaluating accuracy.

The following table summarizes the frequency of the groundwater and surface water MS or MS/MSD sample sets:

Count of Matrix Spike Samples Analyzed for Fall, 2002

Analyses	Number of MS Samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	2	59	3
Dissolved Metals	8	108	7
Inorganics	8	108	7
VOC	2	25	8
SVOC	2	25	8
Explosives	7	49	14
Surface Water			
Metals	3	58	5
Dissolved Metals	3	58	5
Inorganics	3	58	5
VOC	1	16	6
SVOC	1	16	6
Explosives	1	16	6

As shown in the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied, except for the total metals analysis for groundwater samples. Eight groundwater total metals samples were collected, however, due to issues mentioned earlier regarding pH dilution schemes, and to save analytical time and money, only the dissolved fraction samples were reanalyzed. Therefore, for the samples reanalyzed, the associated total metal analysis results were rejected. Likewise, the associated matrix spike results were rendered unusable. Although the QAPP frequency for matrix spikes was not met for total metals, the usability of the total metals data is not considered to be compromised. Losing these total metals matrix spike results could not have been foreseen during the Fall 2002 sampling event.

A number of spike recoveries were outside of the QC acceptance limits of 75%-125%. In general, if less than 25% of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than 25% were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the magnitude of outages, and the number of applicable results relative to the size of the sample set.

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the matrix spike results that were outside of acceptance limits were caused by the sample matrix, a bias in the analytical system, or a combination of both. Recoveries for nearly all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

5.1.1 Groundwater Matrix Spike

The table below summarizes the results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Analyte	Number of Valid Spike Results	Recoveries <75%	Recoveries >125%	Average MS %R	Action
Metals					
Aluminum	5	0	0	104.2	None
Antimony	10	0	0	102.0	None
Arsenic	10	1	4	118.0	J MS - H for all detected results, except for the single sample with a low recovery
Barium	10	0	0	102.2	None
Beryllium	10	0	0	100.9	None
Boron	10	0	1	111.7	Parent only, fewer than a quarter out and average %R within limits
Cadmium	9	0	3	123.0	J MS - H for all detected results
Chromium	7	0	0	96.0	None
Cobalt	10	0	0	94.9	None
Copper	10	2	0	94.2	Parents only, fewer than a quarter out and average %R within limits
Iron	5	0	1	109.5	Parent only, fewer than a quarter out and average %R within limits
Lead	10	0	0	107.8	None
Manganese	4	1	0	94.7	Parent only, a quarter out but average %R within limits and outage was marginal
Nickel	10	2	1	99.5	J/UJ MS - L for all samples except for the single result with a high recovery
Selenium	9	1	1	103.9	Parents only, fewer than a quarter out and average %R within limits
Molybdenum	10	1	0	99.0	Parent only, fewer than a quarter out ND average %R within limits
Silver	10	0	0	102.5	None
Thallium	10	0	0	106.5	None
Vanadium	10	0	0	103.5	None
Zinc	7	1	0	86.1	Parent only, fewer than a quarter out and average %R within limits
Mercury	16	0	0	106.5	None
Cyanide	8	8	0	28.2[1]	J/UJ MS – L for all samples
Inorganics					
Chloride	8	0	0	100.3	None
Sulfate	8	2	0	88.0	None
Nitrate	8	0	1	105.4	None
Hydroxide Alkalinity	1	1	0	70.9	None, due to the acidic nature of samples. See Section 4.2.6 for details.
Carbonate Alkalinity	1	1	0	70.9	
Bicarbonate Alkalinity	7	4	0	60.9	
Total Alkalinity	7	4	0	60.9	
Fluoride	8	0	1	107.8	None
Ammonia	8	2	0	80.8	None

Analyte	Number of Valid Spike Results	Recoveries <75%	Recoveries >125%	Average MS %R	Action
TKN	8	2	0	83.8	None
Nitrite	8	0	1	110.7	None
Orthophosphate	8	0	0	96.5	None
Phosphorus	8	0	0	97.5	None
Total Organic Carbon	8	0	0	100.3	None
VOCs All MS and MSD results were within acceptance ranges					
SVOCs All MS and MSD results were within acceptance ranges except 4-Nitrophenol (MMW-8A-T01N-GRW in WAT017) which had MS and MSD recoveries of 83% and 71%, respectively, with an acceptance range of 10-80%. The recovery of 83% was not considered indicative of unacceptable accuracy and data qualification was not considered necessary.					
Explosives All MS and MSD results were within acceptance ranges except PYX for which 14 out of 14 spike results were outside QC limits (70-130%). The average recovery for the 14 spiked results was 32%. Qualification as UJ MS-L was issued for all PYX results.					

[1] It was not considered necessary to reject nondetect cyanide results despite an average MS %R < 30%. The poor spike recoveries contributing to the low average were conducted on low pH samples.

With the exceptions of arsenic, cadmium, nickel, cyanide and PYX, data qualification was limited to parent samples only. For nickel, cyanide and PYX, the general bias direction suggested by the matrix spike results is low and for arsenic and cadmium, the general bias direction suggested by the matrix spike results is high.

5.1.2 Surface Water Matrix Spike

The table below summarizes the results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Analyte	Number of Valid Spike Results	Recoveries <75%	Recoveries >125%	Average MS %R	Action
Metals					
Aluminum	6	0	1	104.4	J MS-H for parent sample only
Antimony	6	0	0	93.1	None
Arsenic	6	0	0	93.4	None
Barium	6	0	0	99.1	None
Beryllium	6	0	0	100.4	None
Boron	6	0	0	100.2	None
Cadmium	6	0	0	94.4	None
Chromium	6	0	0	98.2	None
Cobalt	6	0	0	96.2	None
Copper	6	0	1	105.0	J MS-H for parent sample only
Iron	6	0	0	106.8	None
Lead	6	0	0	100.3	None
Manganese	6	0	0	100.0	None
Nickel	6	0	0	102.9	None
Mercury	6	0	0	100.6	None

Analyte	Number of Valid Spike Results	Recoveries <75%	Recoveries >125%	Average MS %R	Action
Selenium	6	2	0	78.3	J MS-L for parent samples only because magnitude of exceedances was slight and average recovery was within acceptance range.
Molybdenum	6	0	0	98.9	None
Silver	6	0	0	100.8	None
Thallium	6	0	0	100.4	None
Vanadium	6	0	0	98.2	None
Zinc	6	0	0	100.1	None
Cyanide	3	1	0	73.0	J/UJ MS-L for all field samples.
Inorganics					
Chloride	3	0	0	102.6	None
Sulfate	3	0	0	94.9	None
Nitrate	3	0	0	105.3	None
Hydroxide Alkalinity	3	3	0	1.7	None due to the acidic nature of samples. See Section 4.2.6. for details.
Carbonate Alkalinity	3	1	1	86.7	
Bicarbonate Alkalinity	3	1	1	76.5	
Total Alkalinity	3	0	1	110.6	
Fluoride	3	0	0	101.6	None
Ammonia	3	0	0	89.0	None
TKN	3	0	0	97.5	None
Nitrite	3	0	0	109.8	None
Orthophosphate	3	0	0	87.5	None
Phosphorus	3	0	0	109.3	None
TOC	3	0	0	85.9	None
COD	3	0	0	102.2	None
BOD	3	0	0	103.6	None
VOCs All MS and MSD results were within acceptance ranges					
SVOCs All MS and MSD results were within acceptance ranges					
Explosives All MS and MSD results were within acceptance ranges except PYX for which both the MS and MSD results were outside QC limits (70-130%). The average %R was 30%. Qualification UJ MS-L was issued for all PYX results.					

With the exceptions of cyanide and PYX, data qualification was limited to parent samples only. For both cyanide and PYX, the general bias direction suggested by the matrix spike results is low. Although 2 of 6 selenium MS recoveries were outside QC acceptance limits, qualification was limited to the parent sample only because the magnitude of the outages was slight (72.3% and 70.6%) and the average recovery was within acceptance range.

5.2 LABORATORY DUPLICATES (PRECISION EVALUATION)

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤20% was applied for cases in which both the sample and sample duplicate concentration were greater than

five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL. For metals data, the CRDL is used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL and the IDL was considered to be too low to be used as the baseline for these concentration dependent evaluations. The table below illustrates the site-samples that were used to prepare laboratory duplicate samples.

Field Samples Analyzed for Laboratory Duplicates

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganic parameters
MMW-17B-T/D01N-GRW	Groundwater	WAT016	[6]	x[1]	x[5]
MMW-8A-T/D01N-GRW	Groundwater	WAT017	x	x	x
MMW-31A-T/D01N-GRW	Groundwater	WAT018	[6]	x[1]	x[4]
MMW-32A-T/D01N-GRW	Groundwater	WAT019	[6]	x[1]	x[4]
MMW-11-T/D01N-GRW	Groundwater	WAT019	[6]	x[2]	x[3]
MMW-17A-T/D01N-GRW	Groundwater	WAT020	[6]	x[1]	x[5]
P-2-T/D01N-GRW	Groundwater	WAT020	[6]	x[1]	x[4]
MMW-32B-T/D01N-GRW	Groundwater	WAT022	x	x	x
RR-6-T/D01N-SFW	Surface Water	WAT006	x	x	x
ERLIN-T/D01N-SFW	Surface Water	WAT007	x	x	x
RRS-9-T/D01N-SFW	Surface Water	WAT008	x	x	x

Notes:

[1] Reported in reanalysis package WATRAA1.

[2] Reported in reanalysis package WATRAA2.

[3] Fluoride only reported in reanalysis package WATRAF1.

[4] Fluoride and sulfate only reported in reanalysis package WATRAA1.

[5] Fluoride and sulfate only reported in reanalysis packages WATRAF1 and WATRAA1, respectively.

[6] These class A total metals samples were not reanalyzed; as the total metals results for these samples were rejected, the laboratory duplicate analyses could not be considered valid and usable for assessing precision.

The following table summarizes the frequency of groundwater and surface water LD sample sets:

Count of Laboratory Duplicate Samples Analyzed for Fall, 2002

Analyses	Number of LD Samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	2	59	3
Dissolved Metals	8	108	7
Inorganics	8	108	7
Surface Water			
Metals	3	58	5
Dissolved Metals	3	58	5
Inorganics	3	58	5

As shown in the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied, except for the total metals analysis for groundwater samples. Eight groundwater total metals samples were collected, however, due to issues mentioned earlier regarding pH dilution schemes, and to save analytical time and money, only the dissolved fraction samples were reanalyzed. Therefore, for the samples reanalyzed, the associated total metal analysis results were rejected. Likewise, the associated laboratory duplicate results were rendered unusable. Although the QAPP frequency for laboratory duplicates was not met for total metals, the usability of the total metals data is not considered to be compromised. Losing these total metals laboratory data could not have been foreseen during the Fall 2002 sampling event.

5.2.1 Groundwater Laboratory Duplicate

With the following exceptions, all groundwater laboratory duplicate recoveries were within the laboratory acceptance limits. The table below lists the groundwater laboratory duplicate results outside the laboratory acceptance limits and the qualification applied.

Analyte	Sample ID	Criterion	Criterion Exceedance	Frequency of Limit Exceedance	Action
TSS	MMW-32A-T01N-GRW	|Diff| <1xRL	AD = 5xRL	1 of 8	J D-I for parent sample only
Bicarbonate Alkalinity	MMW-11-T01N-GRW	RPD <20%	RPD = 22%	2 of 8	J D-I for parent sample only
	P-2-T01N-GRW		RPD = 28%		
Total Alkalinity	MMW-11-T01N-GRW	RPD <20%	RPD = 22%	2 of 8	J D-I for parent sample only
	P-2-T01N-GRW		RPD = 28%		
Ammonia	P-2-T01N-GRW	|Diff| <1xRL	AD = 1.3xRL	2 of 8	J D-I for parent sample only
	MMW-32B-T01N-GRW		AD = 1.2xRL		

Qualification was limited to the parent samples because less than or equal to a quarter were outside QC acceptance limits and exceedances were marginal.

5.2.2 Surface Water Laboratory Duplicate

With the following exceptions, all laboratory duplicate recoveries were within the laboratory acceptance limits. The table below lists the surface water laboratory duplicate results outside the laboratory acceptance limits and the qualification applied.

Analyte	Sample ID	Criterion	Criterion Exceedance	Frequency of Limit Exceedance	Action
Aluminum	RRS-9-T01N-SFW	|Diff| <1xCRDL	AD = 1.2xCRDL	1 of 6	J D-I for parent sample only
Copper	RR-6-D01N-SFW	RPD <20%	RPD = 20.4%	1 of 6	None, as 20.4 rounds to 20.
Lead	ERLIN-D01N-SFW	|Diff| <1xCRDL	AD = 1.2xCRDL	1 of 6	J D-I for parent sample only

For aluminum and lead, qualification was limited to the parent samples because less than a quarter were outside QC acceptance limits and exceedances were small. For copper, there was no qualification of the parent sample because 20.4% rounds to 20% which is within QC acceptance limits.

5.3 SERIAL DILUTION RESULTS

Serial dilution tests involve the analysis of a sample and a five-fold dilution of the same sample. When analyte concentrations are sufficiently high (i.e., greater that 50x the instrument detection limit [IDL]), the original result and diluted sample result are expected to be fairly comparable. If the results are not comparable, it is generally assumed that there are matrix interferences that are resulting in the suppression or elevation of the signal for one or more analytes.

The original and diluted sample results are compared by a percent difference (%D). When %Ds <10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate that the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result. The table below lists the groundwater samples and the applicable analytes that were used to perform serial dilution tests.

Field Samples Analyzed for Serial Dilutions

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals
MMW-42B-T01N-GRW	Groundwater	WAT027	x	
MMW-11-D01N-GRW	Groundwater	WAT019		x[2]
MMW-31A-D01N-GRW	Groundwater	WAT018		x[1]
MMW-32A-D01N-GRW	Groundwater	WAT019		x[1]
MMW-32B-T/D01N-GRW	Groundwater	WAT022	x	x
MMW-8A-T/D01N-GRW	Groundwater	WAT017	x	x
MMW-44B-T01N-GRW	Groundwater	WAT026	x	
P-2-D01N-GRW	Groundwater	WAT020		x[1]
MMW-17A-D01N-GRW	Groundwater	WAT020		x[1]
MMW-17B-D01N-GRW	Groundwater	WAT016		x[1]
EW-1-T01N-GRW	Groundwater	WAT024	x	
MW-7A-T01N-GRW	Groundwater	WAT015	x	
RR-5-T01N-SFW	Surface Water	WAT004	x	
RR-6-T/D01N-SFW	Surface Water	WAT006	x	x
RRS-9-T/D01N-SFW	Surface Water	WAT008	x	x
RR-12-D01N-SFW	Surface Water	WAT004		x
RR-18B-T01N-SFW	Surface Water	WAT002	x	
LR-11A-T01N-SFW	Surface Water	WAT001	x	
ERLIN-T/D01N-SFW	Surface Water	WAT007	x	x
SW12-4-T01N-SFW	Surface Water	WAT005	x	

Notes:

[1] Reported in reanalysis package WATRAA1.

[2] Reported in reanalysis package WATRAA2.

5.3.1 Groundwater Serial Dilutions

A number of %Ds between the original sample results and the result obtained from a sample diluted 1:5 were >10%. In general, qualification was generally limited to the parent samples if less than a quarter of the valid serial dilution results for a given metal were outside of the acceptance range. Conversely, qualification was generally considered necessary if more than a quarter of the results for a metal were outside the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set, the magnitude of outages, and the average %D were also taken into consideration. The table below summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued.

Serial Dilution Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		Action
				Low	High	
Aluminum	3	0	3.7	0	0	None
Antimony	0	0	NA	0	0	None
Arsenic	0	0	NA	0	0	None
Barium	0	0	NA	0	0	None
Beryllium	0	0	NA	0	0	None
Boron	0	0	NA	0	0	None
Cadmium	0	0	NA	0	0	None
Calcium	8	0	3.4	0	0	None
Chromium	0	0	NA	0	0	None
Cobalt	0	0	NA	0	0	None
Copper	1	0	8.3	0	0	None
Iron	4	0	2.0	0	0	None
Lead	0	0	NA	0	0	None
Magnesium	8	1	5.7	0	1	J DL-H for parent sample only
Manganese	9	2	10.3	0	2	J DL-H for all detected reanalysis samples
Nickel	1	0	3.3	0	0	None
Selenium	0	0	NA	0	0	None
Molybdenum	1	0	0.5	0	0	None
Potassium	1	0	2.8	0	0	None
Thallium	0	0	NA	0	0	None
Vanadium	0	0	NA	0	0	None
Silver	0	0	NA	0	0	None
Sodium	7	2	6.9	0	2	J DL-H for parent samples only
Zinc	5	0	4.2	0	0	None

Magnesium and sodium exhibited valid serial dilution results outside QC acceptance limits. However, because the average differences were within acceptance limits and the relatively small number of individual results outside acceptance limits, qualification was limited to the parent samples only. Manganese, for reanalyzed samples, exhibited valid serial dilution results (2 of 3), as well as average differences, outside QC acceptance limits. Therefore, qualification was applied to dissolved manganese results for all reanalyzed samples.

5.3.2 Surface Water Serial Dilutions

All %Ds between the original sample results and the result obtained from a sample diluted 1:5 were within QC limits and data qualification was not necessary.

The site-specific duplicate samples, rinsate blanks and field blanks were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrices. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

6.1 FIELD DUPLICATE SAMPLES

Field duplicate samples were collected during this sampling event for metals, inorganics, Volatile Organic Compounds (VOCs), Semivolatile Organic Compounds (SVOCs), and explosives. The frequency of field duplicate collection satisfied the QAPP requirement of 5%.

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤30% was applied for cases in which both the sample and sample duplicate concentrations were greater than five times the RL. For field duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than two times the greater RL. For metals data, the CRDL is used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL and the IDL was considered to be too low to be used as the baseline for these concentration dependent evaluations. The tables below summarize the samples submitted for duplicate analyses and the frequency of field duplicates per analyte class.

Water Samples Submitted for Field Duplicate Analyses

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	Hardness	Volatile Organics	Semivolatile Organics	Explosives
MW-7A-T/D01N, T/D01D-GRW	Groundwater	WAT015	x	x	x	x			
MMW-19A-T/D01N, T/D01D-GRW	Groundwater	WAT018		x[1]	x[1]	x[1]			x
MMW-31A-T/D01N, T/D01D-GRW	Groundwater	WAT018		x[1]	x[1]	x[1]			x
MMW-8B-T/D01N, T/D01D-GRW	Groundwater	WAT017/ WAT018		x[1]	x[1]	x[1]	x	x	x
MMW-11A-T/D01N, T/D01D-GRW	Groundwater	WAT019		x[1]	x[1]	x[1]			x
MMW-7-T/D01N, T/D01D-GRW	Groundwater	WAT020		x[1]	x[1]	x[1]	x	x	x
DOUGLASWELL-T/D01N, T/D01D-GRW	Groundwater	WAT025/ WAT026		x[1]	x[1]	x[1]			x
LR-8A-T/D01N, T/D01D-SFW	Surface Water	WAT001	x	x	x	x	x	x	x
RRS-18-T/D01N, T/D01D-SFW	Surface Water	WAT005/ WAT006	x	x	x	x			
ERLOUT-T/D01N, T/D01D-SFW	Surface Water	WAT008	x	x	x	x			

[1] Reported in reanalysis package WATRAA1.

Field Duplicate Collection Frequency for the Fall, 2002 Sampling Event

Analyses	Number of FD Samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	1	59	1
Dissolved Metals	7	108	6
Inorganics	7	108	6
VOC	2	25	8
SVOC	2	25	8
Explosives	4	49	8
Surface Water			
Total Metals	3	58	5
Dissolved Metals	3	58	5
Inorganic parameters	3	58	5
VOC	1	16	6
SVOC	1	16	6
Explosives	1	16	6

As shown in the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied, except for the total metals analysis for groundwater samples. Seven groundwater total metals samples were collected, however, due to issues mentioned earlier regarding pH dilution schemes, to save analytical time and money only the dissolved fraction samples were reanalyzed. Therefore, for the samples reanalyzed, the associated total metal analysis results were rejected. Although the field duplicate frequency was not met for total metals, the usability of the data is not considered to be compromised. Losing these total metals field duplicate results could not have been foreseen during the Fall 2002 sampling event.

6.1.1 Groundwater Field Duplicate Results

With eight exceptions, the applicable evaluation criteria were met. The exceptions and the resultant data qualifiers are summarized in the table below.

Groundwater Field Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte	Sample ID	Criterion	Criterion Exceedance	Action
Bicarbonate Alkalinity	MMW-8B-T01N/T01D-GRW	RPD≤30%	RPD = 48.5%	J/UJ FD-I for parent sample only.
Orthophosphate	MW-7A-T01N/T01D-GRW	|Diff|<2xRL	AD = 22.8xRL	J/UJ FD-I for parent sample only.
	DOUGLASWELL-T01N/T01D-GRW	|Diff|<2xRL	AD = 52xRL	J/UJ FD-I for parent sample only.
Phosphorus	MMW-7-T01N/T01D-GRW	RPD≤30%	RPD = 163.9%	J/UJ FD-I for parent sample only.
TDS	MMW-7-T01N/T01D-GRW	RPD≤30%	RPD = 39.6%	J/UJ FD-I for parent sample only.
Total Alkalinity	MMW-8B-T01N/T01D-GRW	RPD≤30%	RPD = 48.5%	J/UJ FD-I for parent sample only.
TSS	MMW-31A-T01N/T01D-GRW	|Diff|<2xRL	AD = 2.4xRL	J/UJ FD-I for parent sample only.
	MMW-7-T01N/T01D-GRW	RPD≤30%	RPD = 71.3%	J/UJ FD-I for parent sample only.

RPD = Relative Percent Difference AD = Absolute Difference (i.e., |Diff|)

For bicarbonate alkalinity, phosphorous, TDS and total alkalinity, qualifications were limited to parent samples only because fewer than quarter (1 of 7) of the results were outside of QC limits and for those out, the outages were marginal in magnitude. For TSS, although 2 of 7 (29%) results were outside QC acceptance limits, qualifications were limited to parent samples only because one of the results was marginally outside (2.4xRL) and therefore, there did not appear to be conclusive evidence of a systematic trend. For orthophosphate, although 2 of 7 (29%) results were outside QC acceptance limits, qualifications were limited to parent samples because both of the results were qualified as estimate based on total versus partial disagreement and therefore, the results are suspect and are not considered appropriate for use in assessing a potential systematic trend.

6.1.2 Surface Water Field Duplicates Results

With two exceptions, the applicable evaluation criteria were met. The exceptions and the resultant data qualifier are summarized in the table below.

Surface Water Field Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Analyte	Sample ID	Criterion	Criterion Exceedance	Action
Iron	RRS-18-T01N/T01D-SFW	|Diff| <2xRL	AD = 4.7xCRDL	J/UJ FD-I for parent sample only.
Orthophosphate	ERLOUT-T01N/T01D-SFW	|Diff| <2xRL	AD = 37xRL	J/UJ FD-I for parent sample only.

RPD = Relative Percent Difference AD = Absolute Difference (i.e., \|Diff\|)

For both iron and orthophospate, qualification was limited to the parent samples because only 1 of 3 results were outside QC control limits.

6.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. The following rinsate blanks were collected during the Fall 2002 sampling event:

Rinsate Blanks Collected During the Fall, 2002 Sampling Event

Sample ID (Date)	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
RB01T/D-GRW (10/29)	Groundwater	WAT015	x	x	x			
MMW-8A-RB02T/D-GRW (11/03)	Groundwater	WAT017	x	x	x	x	x	x
RB03T-GRW (11/04)	Groundwater	WAT019	x		x			x
RB10T/D-GRW (11/05)	Groundwater	WAT021	x	x	x	x	x	
RB04T/D-GRW (11/06)	Groundwater	WAT022	x	x	x			x
RB09T-GRW (11/06)	Groundwater	WAT022	x		x			
RB07T/D-GRW (11/07)	Groundwater	WAT025	x	x	x			
RB01T/D-SFW (10/04)	Surface Water	WAT007	x	x	x	x		
RB01T/D-SFW (10/07)	Surface Water	WAT008	x	x	x			

Sample ID (Date)	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
RB01T/D-SFW (10/09)	Surface Water	WAT009	x	x	x			

The QAPP required frequency of 5% for the collection of rinsate blanks was met for the Fall, 2002 water sampling event for both matrices.

While any potential metals contribution to the rinsate blanks from contaminated sampling equipment would be captured in the total metals analyses, several rinsate blanks were analyzed for dissolved metals as well. The sampling for dissolved metals was conducted using factory sealed, dedicated and disposable filter cartridges. Therefore, positive dissolved metals results would reflect a fraction of the total metals concentrations in the associated rinsate blank or potential metals contribution from the filter media.

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result or biasing the average high by using the reporting limit.

6.2.1 Groundwater Rinsate Blanks

The following groundwater rinsate blank results and their effects regarding groundwater results qualification are provided in the following table.

Groundwater Rinsate Blank Outliers and Corresponding Results Qualification for Samples Collected during Fall, 2002

Analyte	Sample ID	Detected Conc.	RL	Frequency of Detection	Average RB Concentration	Sample Result Range	Action
Total Metals (ug/l)							
Aluminum	RB03T-GRW (11/04)	6.4	6.0	2 of 7	7.35	3-57,600	All total aluminum results <36.8 ug/l were qualified as nondetect (U RB-I)
	RB10T-GRW (11/05)	36.1					
Arsenic	RB07T-GRW (11/07)	0.26	0.2	1 of 7	0.12	0.2 – 8.6	None necessary as frequency of detection was less a quarter of the RBs
Copper	RB09T-GRW (11/06)	6.3	0.6	1 of 7	1.16	0.3 – 10,500	None necessary as frequency of detection was less a quarter of the RBs
Manganese	RB03T-GRW (11/04)	9.7	2.5	2 of 7	2.68	0.7 – 426,000	All total manganese results <13.4 ug/l were qualified as nondetect (U RB-I)
	RB10T-GRW (11/05)	2.8					
Zinc	RB03T-GRW (11/04)	8.5	6.9	1 of 7	4.17	2.1 – 93,200	None necessary as frequency of detection was less a quarter of the RBs

Analyte	Sample ID	Detected Conc.	RL	Frequency of Detection	Average RB Concentration	Sample Result Range	Action
Dissolved Metals (ug/l)							
Arsenic	RB07D-GRW (11/07)	0.36	0.2	1 of 5	0.23	0.20 – 74.2	None necessary as frequency of detection was less a quarter of the RBs
Copper	RB04D-GRW (11/06)	0.84	0.6	2 of 5	0.46	0.3 – 9,060	All dissolved copper results <2.3 ug/l were qualified as nondetect (U RB-I)
	RB07D-GRW (11/07)	0.7	0.3				
Selenium	RB01D-GRW (10/29)	0.2	0.2	1 of 5	0.12	0.2 - 390	None necessary as frequency of detection was less a quarter of the RBs
Inorganics (mg/l)							
TDS	RB01T-GRW (10/29)	45	5	5 of 6	21.5	42 – 26,100	All TDS results <108 mg/l were qualified as nondetect (U RB-I)
	MMW-8A-RB02T-GRW (11/03)	8					
	RB04T-GRW (11/06)	15					
	RB09T-GRW (11/06)	46					
	RB07T-GRW (11/07)	10					
TSS	RB03T-GRW (11/04)	0.5	0.5	2 of 7	0.35	0.5 – 1,280	All TSS results <1.75 mg/l were qualified as nondetect (U RB-I)
	RB09T-GRW (11/06)	0.7					
Sulfate	RB10T-GRW (11/05)	2.7	0.4	1 of 7	0.56	10.5 – 16,100	None necessary as frequency of detection was less a quarter of the RBs
Nitrate	RB01T-GRW (10/29)	0.45	0.4	1 of 7	0.24	0.2 - 87	None necessary as frequency of detection was less a quarter of the RBs
Bicarbonate Alkalinity	MMW-8A-RB02T-GRW (11/03)	1	1	5 of 7	0.90	1 – 1,230	All bicarbonate alkalinity results <4.5 mg/l were qualified as nondetect (U RB-I)
	RB10T-GRW (11/05)	1.1					
	RB04T-GRW (11/06)	1.1					
	RB09T-GRW (11/06)	1					
	RB07T-GRW (11/07)	1.1					
Total Alkalinity	MMW-8A-RB02T-GRW (11/03)	1	1	5 of 7	0.90	1 – 1,230	All total alkalinity results <4.5 mg/l were qualified as nondetect (U RB-I)
	RB10T-GRW (11/05)	1.1					
	RB04T-GRW (11/06)	1.1					
	RB09T-GRW (11/06)	1					
	RB07T-GRW (11/07)	1.1					
Fluoride	RB03T-GRW (11/04)	0.12	0.1	1 of 7	0.06	0.17 – 6.7	None necessary as frequency of detection was less a quarter of the RBs
Ammonia as N	RB01T-GRW (10/29)	0.32	0.04	6 of 7	0.13	0.024 – 7	All ammonia results <0.65 mg/l were qualified as nondetect (U RB-I)
	MMW-8A-RB02T-GRW (11/03)	0.23					
	RB10T-GRW (11/05)	0.15					
	RB04T-GRW (11/06)	0.063					
	RB09T-GRW (11/06)	0.055					
	RB07T-GRW (11/07)	0.099					
TKN	RB10T-GRW (11/05)	0.24	0.24	1 of 7	0.14	0.24 – 5.4	None necessary as frequency of detection was less a quarter of the RBs
VOCs (ug/l)							
Methylene Chloride	RB10T-GRW (11/05)	2	10	1 of 2	3.5	10 – 10	None because all field sample concentrations were nondetect (U RB-I)

Analyte	Sample ID	Detected Conc.	RL	Frequency of Detection	Average RB Concentration	Sample Result Range	Action
Chloroform	MMW-8A-RB02T-GRW (11/03)	6	10	2 of 2	6	10 – 10	None because all field sample concentrations were nondetect (U RB-I)
	RB10T-GRW (11/05)	6					
SVOCs (ug/l)							
Bis(2-ethylhexyl) phthalate	MMW-8A-RB02T-GRW (11/03)	9	10	1 of 2	7	0.6 - 11	All results <35.0 ug/l were qualified as nondetect (U RB-I)

While some results were qualified as non-detect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and at relatively low levels.

6.2.2 Surface Water Rinsate Blanks

The surface water rinsate blank results and their effects regarding surface water results qualification are provided in the following table:

Surface Water Rinsate Blank Outliers and Corresponding Results Qualification for Surface Water Samples

Analyte	Sample ID	Detected Conc.	RL	Frequency of Detection	Average RB Concentration	Sample Result Range	Action
Total Metals (ug/l)							
Antimony	RB01T-SFW (10/04)	0.53	0.2	1 of 3	0.24	0.2 – 4.3	All total antimony results <1.2 ug/l were qualified as nondetect (U RB-I)
Iron	RB01T-SFW (10/09)	28.3	22.6	1 of 3	22.03	22.6 – 2,300	All total iron results <110 ug/l were qualified as nondetect (U RB-I)
Lead	RB01T-SFW (10/09)	0.11	0.1	1 of 3	0.07	0.1 – 5.1	All total lead results <0.35 ug/l were qualified as nondetect (U RB-I)
Manganese	RB01T-SFW (10/09)	3.3	2.5	1 of 3	1.33	1.2 – 3,860	All total manganese results <6.7 ug/l were qualified as nondetect (U RB-I)
Dissolved Metals (ug/l)							
Aluminum	RB01D-SFW (10/09)	49.2	3	1 of 3	17.4	3 – 2,750	All dissolved aluminum results <87 ug/l were qualified as nondetect (U RB-I)
Lead	RB01D-SFW (10/07)	0.21	0.1	1 of 3	0.1	0.1 – 1.4	All dissolved lead results <0.52 ug/l were qualified as nondetect (U RB-I)
Inorganics (mg/l)							
Ammonia	RB01T-SFW (10/07)	0.042	0.04	2 of 3	0.033	0.024 – 0.31	All ammonia results <0.167 mg/l were qualified as nondetect (U RB-I)
	RB01T-SFW (10/04)	0.038	0.024				

Analyte	Sample ID	Detected Conc.	RL	Frequency of Detection	Average RB Concentration	Sample Result Range	Action
TSS	RB01T-SFW (10/07)	1.6	0.63	3 of 3	2.73	0.5 – 61.2	All TSS results <13.5 mg/l were qualified as nondetect (U RB-I)
	RB01T-SFW (10/09)	1.8	0.56				
	RB01T-SFW (10/04)	4.8	1				
Bicarbonate Alkalinity	RB01T-SFW (10/07)	1.2	1	1 of 3	0.73	26.5 - 164	None because all sample concentrations were greater than the qualification threshold
Total Alkalinity	RB01T-SFW (10/07)	1.2	1	1 of 3	0.73	26.5 - 164	None because all sample concentrations were greater than the qualification threshold
Fluoride	RB01T-SFW (10/09)	0.1	0.1	1 of 3	0.08	0.2 - 10	All fluoride results <0.42 mg/l were qualified as nondetect (U RB-I)
Phosphorous	RB01T-SFW (10/07)	0.014	0.01	2 of 3	0.01	0.01 – 0.4	All phosphorous results <0.12 mg/l were qualified as nondetect (U RB-I)
	RB01T-SFW (10/09)	0.024					
TDS	RB01T-SFW (10/07)	7	5	2 of 2	7.5	107 – 2,690	None because all sample concentrations were greater than the qualification threshold
	RB01T-SFW (10/04)	8					
VOCs (ug/l)							
Chloroform	RB01T-SFW (10/04)	3	10	1 of 1	3	10 – 10	All chloroform results <15 ug/l were qualified as nondetect (U RB-I)

While some results were qualified as non-detect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and at relatively low levels.

For RB01T-SFW (10/07), there was a significant orthophosphate detection of 32.8 mg/l reported. However, the result was disregarded in the rinsate blank evaluation because the orthophosphate result was approximately 3000x greater than the total phosphorus result of 0.014 mg/l. Additionally, the orthophosphorus result for this rinsate blank is inconsistent with the TDS result of 7 mg/l. As such, the orthophosphorus result was rejected.

6.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field blanks are only required to be collected by the project QAPP when samples are analyzed for organics.

The table below summarizes the number of field blanks samples collected for each aqueous medium for each analysis type.

	VOCs	SVOCs	Explosives
Number of GRW FBs	2	2	3
Number GRW samples	25	25	49
Frequency GRW FBs	8%	8%	6%
Number of SFW FBs	1	1	1
Number of SFW samples	16	16	16
Frequency SFW FBs	6%	6%	6%

The table above indicates that the frequency of field blank sample collection met the QAPP requirement of 5% (i.e., one per 20 field samples).

6.3.1 Groundwater Field Blank Results

Three target analytes were detected in the groundwater field blank samples. The results are summarized in the table below.

Field ID	Compound	Analyte Class	Concentration	Sample Result Qualification
FB01T-GRW	Chloroform	VOC	6.0 ug/l	None because all sample results were nondetect.
FB03T-GRW	1,1,1-Trichloroethane	VOC	8.0 ug/l	1,1,1-Trichloroethane results <40 ug/l were qualified as nondetect (U FB – I). (6 results were qualified)
FB01T-GRW	Bis(2-ethylhexyl)phthalate	SVOC	6.0 ug/l	Bis(2-ethylhexyl)phthalate results <30 ug/l were qualified as nondetect (U FB – I). (4 results were qualified)

In general, the groundwater field blank results are not considered to be indicative of significant contamination problems due to ambient conditions as the detections were minimal and the detected concentrations were below the reporting limit of 10 ug/l. Nonetheless, data qualification was issued in order to compensate for potential contamination of field samples due to ambient conditions.

6.3.2 Surface Water Field Blank Results

No target analytes were detected in surface water rinsate blanks. As such, data qualification was not necessary and the field blank results indicate that potential contamination of samples due to ambient environmental conditions was unlikely.

With the exception of total metals results for 54 groundwater samples, the data are considered acceptable for use in meeting project objectives as qualified. The total metals results for 54 groundwater samples were rejected on the basis of comparability with historical results and dilution scheme issues. Some sample results were qualified as nondetect on the basis of laboratory blank contamination and some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summaries. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

7.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

For groundwater, 98% and 99% of the laboratory and field duplicate results, respectively, satisfied the applicable criteria. For surface water, 99% of the laboratory and field duplicate results satisfied the applicable criteria. As such, the overall level of precision demonstrated is considered to be acceptable.

Upon data analysis, the chloride result reported for sample MMW-24-T01N-GRW from the Fall of 2002, 275 mg/l, was found not to be comparable to other data for this well. The other five chloride measurements for this well ranged in concentrations from 19.9 to 40.1 mg/l.

The raw data revealed that there were four dilutions analyzed for this sample. The chloride results found in the raw data for the 2x, 10x, 200x, and 1000x dilutions were 36.7, 170, 83.7, and 275 mg/l, respectively. The result from the 1000-fold dilution was the result selected for reporting. While the result obtained from the 2x dilution fits into the range of values reported for subsequent sampling events, this result was not selected for reporting due to chromatographic considerations (i.e., poor peak shape and incomplete resolution). Unlike the other samples reported in the package for which good precision between multiple dilutions was observed when the measured value fell within the mid-range of the calibration curve, the precision among the various measurements for this sample was poor because the dilutions all resulted in values at the extreme ends of the calibration curve, where results tend to be less accurate.

As such, the chloride result for sample MMW-24-T01N-GRW from the Fall 2002 sampling event was qualified as unusable (R REP-H). A code of "REP" was used to indicate poor reproducibility.

7.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of Laboratory Control Samples (LCSs) and MSs.

All of the LCS results, except for PYX reviewed during the laboratory performance review of WAT003 and WAT020, satisfied the applicable evaluation criteria for accuracy specified in the QAPP. This indicates acceptable overall accuracy with respect to the analytical system.

Approximately 92% and 93% percent of the MS recoveries for groundwater and surface water, respectively, satisfied the applicable evaluation criteria for accuracy specified in the QAPP, indicating that acceptable overall accuracy was attained with respect to the site matrix.

7.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements in relation to the number of measurements requested.

As mentioned earlier, 54 of the 115 (including field duplicates) groundwater samples analyzed for total metals were rejected due to analytical problems encountered with matrix related issues. Reanalysis of the dissolved fraction for samples with matrix-related issues yielded acceptable results and therefore, there are valid metal analyses for every groundwater sample collected. As mentioned earlier, numerous fluoride and sulfate analyses were initially rejected and subsequently later reanalyzed. All reanalysis results are valid and supersede the rejected results. Therefore, all groundwater results are considered usable as qualified for meeting project objective. In addition, no surface water results were rejected and, therefore, are considered usable as qualified. As such, the completeness for the samples analyzed, excluding groundwater total metals, is 100%, which satisfies the QAPP completeness goal of 80%.

7.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting Field Sampling Plan FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the biota samples. The close agreement between the field duplicate results, as discussed above in Section 6.1, indicates that the samples collected were adequately representative of the medium sampled.

Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. Again, the close agreement between duplicates noted in Section 5.2 indicates that sample processing and subsampling procedures were acceptable.

7.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and

through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

7.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. As such, obtaining some nondetect results with elevated reporting limits was not avoidable. While it is anticipated that all data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT001 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed

Peer Reviewer: Stacey Coker Date Completed: 05/19/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
LR-16-T01N-SFW	SA	502601	LR16T01N-SFW or LR16T01NSFW or LR16-T01N-SFW	W	X	X	X	X	X		
LR-16-D01N-SFW	SA	502602		W	X						
TB-01-SFW	TB	502603		W			X				
LR-13-T01N-SFW	SA	502604		W	X	X					
LR-13-D01N-SFW	SA	502605		W	X						
MSS4A3-30-T01N-RB01T	RB	502606		W	X	X					
LR-11A-T01N-SFW	SA	502727		W	X	X					
LR-11A-D01N-SFW	SA	502728		W	X						
LR-8A-T01D-SFW	FD	502729	LR8AT01D-SFW or LR8AT01DSFW or LR8A-T01DSFW	W	X	X	X	X	X		
LR-8A-D01D-SFW	FD	502730		W	X						
TB02-SFW	TB	502731		W			X				
LR-8A-T01N-SFW	SA	502732	LR8AT01N-SFW or LR8AT01NSFW or LR8A-T01DSFW	W	X	X	X	X	X		
LR-8A-D01N-SFW	SA	502733		W	X						
TB01-SFW	TB	502734		W			X				
RB01T-SOL	RB	502735		W		X					
LR-4-T01N-SFW	SA	502975		W	X	X					
LR-4-D01N-SFW	SA	502976		W	X						
LR-5-T01N-SFW	SA	502977		W	X	X					
LR-5-D01N-SFW	SA	502978		W	X						
LR-1-T01N-SFW	SA	502979	LR1-T01N-SFW or LR1T01NSFW	W	X	X	X	X	X		
LR-1-D01N-SFW	SA	502980		W	X						
TB-01-SFW	TB	502981	TB-01SFW	W			X				
RR-20-T01N-SFW	SA	502982	RR20T01N-SFW or RR20T01NSFW or RR-20T01NSFW	W			X				

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RR-20-T01N-SFW	SA	502983		W	X	X		X	X		
RR-20-D01N-SFW	SA	502984		W	X						

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3, rather than Nitrate as N. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. Thus, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. However, the error was not discovered until after the results for WAT packages 001 through 009 were reported. The laboratory issued replacement data sheets for data packages WAT001 through WAT009, which were collated into the original data sets. The original nitrate data sheets for the affected packages were marked as superseded. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were problems noted with sample receipt. Sample LR-11A-D01N-SFW was accidentally written on the COC as LR-11A-D01D-SFW missing the matrix code suffix. The laboratory was contacted and the correction was made so that the sample was logged in with the correct field ID. Four trip blanks were submitted for analysis, however, the volatile organics compound (VOC) analysis for one of the trip blanks was accidentally not marked on the COC. The laboratory was contacted and the correction was made so that all four trip blanks were logged in for VOC analysis. Samples LR-1-T01N-SFW and RR-20-T01N-SFW were inadvertently marked on the COC for Pesticide and PCB analysis, however, no volumes were sent for the analysis. The laboratory was contacted and the correction was made so that these two samples were not logged in for Pesticide and PCB analysis.
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, orthophosphate, and BOD. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Laboratory Blank Results	No	Aluminum, boron, 1,2,4-Trichlorobenzene, 1,2-dibromo-3-chloropropane, 1,1,2,2-Tetrachloroethane, and 1,2-Dichlorobenzene were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution LR-11A-T01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution test for sample LR-11A-T01N-SFW was applicable for 10 of the 24 metals. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. Recovery for internal standard Li was high for the ICPMS analysis of all of the field samples in this SDG. Therefore, the potassium results for these samples were reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate LR-8A-T01D-SFW LR-8A-D01D-SFW • Rinsate Blank MSS4A3-30-T01N-RB01T RB01T-SOL • Field Blank • Trip Blank TB-01-SFW 9/26 TB02-SFW TB01-SFW 9/27 TB-01-SFW 9/30 • Other (e.g., splits)	No	There were a few detections in the various field quality control blanks (RB and TB). These are summarized in Tables 1.3 and 1.4. The RB results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial and continuing calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	BOD (mg/L)
LR-16-T01N-SFW	0.47 UJ	---	---	---
LR-11A-T01N-SFW	0.47 UJ	0.005 UJ	0.015 J	1.4 UJ
LR-8A-T01D-SFW	0.48 UJ	0.005 UJ	0.011 J	1.4 UJ
LR-8A-T01N-SFW	0.48 UJ	0.005 UJ	0.010 UJ	1.4 UJ
RB01T-SOL	0.20 UJ	0.005 UJ	---	---
LR-4-T01N-SFW	0.20 UJ	0.005 UJ	0.011 J	1.4 UJ
LR-5-T01N-SFW	1.8 J	0.005 UJ	0.010 UJ	1.4 UJ
LR-1-T01N-SFW	---	0.005 UJ	0.010 UJ	1.4 UJ
RR-20-T01N-SFW	---	0.005 UJ	0.010 UJ	1.4 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (MS)	5.0	---	---	3.0	LR-4-D01N-SFW, MSS4A3-30-T01N-RB01T	U CCB-I
Boron (P)	9.2	6.0	6.492	5.0	LR-16-T01N-SFW, LR-16-D01N-SFW, LR-13-T01N-SFW, LR-13-D01N-SFW, LR-11A-T01N-SFW, LR-11A-D01N-SFW, LR-8A-T01N-SFW, LR-8A-D01N-SFW, LR-8A-T01D-SFW, LR-8A-D01D-SFW, LR-5-T01N-SFW, LR-5-D01N-SFW, LR-1-D01N-SFW, RR-20-D01N-SFW	U CCB-I U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Positive Results for Rinsate Blanks

Analyte	MSS4A3-30-T01N-RB01T	RB02T-SOL
Ammonia (mg/L)	0.030	---
Total Dissolved Solids (mg/L)	---	6.0
Bicarbonate Alkalinity (mg/L)	---	1.0
Total Alkalinity (mg/L)	---	1.0
Copper (µg/l)	0.47	---
Manganese (µg/l)	1.9	---

Table 1.4
Positive Results for Trip Blanks

Analyte	TB-01-SFW 9/30	Action
Tetrachloroethane (µg/l)	1	For LR-1-T01N-SFW, the tetrachloroethene result was qualified as nondetect.

Table 1.5
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC ICAL Date/Time	Analyte	|%D| >30%	Action	Qualification and Qualification Codes
9/10/03 (1113)	Benzaldehyde	34.0%	Results for these analytes in associated samples were qualified as estimated.	UJ ICAL-I

Table 1.7
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
10/1/03 (1415)	Benzaldehyde 2-Methylnaphthalene 2,4-Dinitrophenol Pentachlorophenol	53.9% 31.8% 27.5% 34.6%	LR-16-T01N-SFW	UJ CCAL-I
10/7/03 (1506)	Benzaldehyde Pentachlorophenol	63.4% 33.5%	LR-1-T01N-SFW, LR-8A-T01N-GRW, LR-8A-T01D-GRW, RR-20-T01N-SFW	UJ CCAL-I

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT002 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Validationer: Ansley Watson Date Completed: 1/14/03

Peer Reviewer: Alan Roberts Date Completed: 1/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RR-18B-T01N-SFW	SA	503002		W	X	X					
RR-18B-D01N-SFW	SA	503003		W	X						
RRS-1-T01D-PLTF	RB	503004		W	X						
RRS-1-T02D-PLTF	RB	503005		W	X						
TB-01-SED	TB	503006		W			X				
RR-18A-T01N-SFW	SA	503258		W	X	X					
RR-18A-D01N-SFW	SA	503259		W	X						
RR-17-T01N-SFW	SA	503260		W	X	X					
RR-17-D01N-SFW	SA	503261		W	X						
RR-16-T01N-SFW	SA	503262		W	X	X					
RR-16-D01N-SFW	SA	503263		W	X						
RR-15-T01N-SFW	SA	503264	RR15T01NSFW or RR-15T01NSFW	W	X	X	X	X	X		
RR-15-D01N-SFW	SA	503265		W	X						
RR-15-TB01-SFW	TB	503266		W	X		X				
RR-14-T01N-SFW	SA	503267		W	X	X					
RR-14-D01N-SFW	SA	503268		W	X						
RR-13-T01N-SFW	SA	503269		W	X	X					
RR-13-D01N-SFW	SA	503270		W	X						
RR-11C-T01N-SFW	SA	503271		W	X	X					
RR-11C-D01N-SFW	SA	503272		W	X						
MSS3-6-T01D-PLTG	RB	503273		W	X						
MSS3-6-T02D-PLTS	RB	503274		W	X						
RR-15-TB01-SED	TB	503311		W			X				

Matrix: W = Water

SA = Sample TB = Trip Blank RB = Rinsate Blank

[1] The matrix code at the end of the field I D indicates the sample matrix that the QC sample is associated with.

[2] Due to limitations of the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, they are identified under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

This package included the ion chromatography (IC) initial calibration data for 10/02/02 and 10/13/02. The initial calibration curve from 10/02/02 was used to calculate the reported sample results. The 10/13/02 curve included in the package was considered invalid and was not saved by the laboratory data system. The 10/13/02 curve included in the package should be disregarded.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3, rather than Nitrate as N. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. Thus, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. However, the error was not discovered until after the results for WAT packages 001 through 009 were reported. The laboratory issued replacement data sheets for data packages WAT001 through WAT009, which were collated into the original data sets. The original nitrate data sheets for the affected packages were marked as superseded. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

It was noted in the laboratory case narrative that the semivolatile organic compounds analysis of the blank spike sample S4LCS yielded a slightly elevated percent recovery (85%) of the target compound 4-Nitrophenol and (104%) of the target compound pentachlorophenol. The CLP method does not require the blank spike to be analyzed for the semivolatile organic compounds; however, the laboratory did report these values along with their historical QC limits of 10-80 and 9-103 respectively. The blank spike in this analytical set is actually at a higher or equivalent accuracy than the historical QC limits. Accuracy of 85% and 104% are considered acceptable; therefore no qualifications are necessary.

The continuing calibration check standards that immediately follow the ICSABs on the ICB/MS instrument consistently yield elevated percent recovery for Aluminum due to carryover from the ICSABs. This carryover is not considered likely to affect samples since the blank sample following the CCV had non-detectable aluminum. No qualification of the associated data was considered necessary.

The case narrative indicates that during the alkalinity analysis of the samples in this SDG, the associated blank samples yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the blank sample result was reported as nondetect at a RL of 1mg/L from this analysis. No qualification of the associated data was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	On the COC form, PCB and Pesticides analyses were erroneously requested for sample RR-15-T01N-SFW. However, the required sample volume was not submitted. It was confirmed that these tests were not required for the Fall 2002 sampling program.
Holding Times	Yes	
Laboratory Blank Results	No	Aluminum, Boron, and Copper were detected in various blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-18B-T01N-SFWL • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	For sample RR-15-T01N-SFW, the surrogate recovery for the explosives analysis was low. The recovery of the 1,2-Dinitrobenzene was 80% outside the acceptance range of 85-115% suggesting potential low bias. As a result, all explosive results for this sample were qualified as estimated (J or UJ). The serial dilution test for sample RR-18B-T01N-SFWL was applicable for 9 of the 24 metals. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. Molybdenum results for sample RR-18A-D01N-SFW and RR-18A-T01N-SFW were qualified as estimated (J/UJ TVP-I) because the dissolved molybdenum result was greater than the total molybdenum result.
Field QC • Field Duplicate • Rinsate Blank RRS-1-T01D-PLTF 9/27 RRS-1-T02D-PLTF 9/27 MSS3-6-T01D-PLTG 10/1 MSS3-6-T02D-PLTS 10/1 • Field Blank • Trip Blank TB-01-SED 9/30 RR-15-TB01-SED 10/1 RR-15-TB01-SFW 10/1 • Other (e.g., splits)	Yes	There were a few detections in the various field quality control blanks (RB). These are summarized in Tables 1.2. The RB results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial and continuing calibration for VOCs were all within their percent recoveries, therefore no qualification was necessary. Table 1.3 and 1.4 summarizes the initial and continuing calibration detections for SVOCs and the resultant data qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	MB (µg/l)	IDL	Qualified Data	Qualification Code
Boron (P)	---	4.968	4.8	RR-11C-D01N-SFW, RR-11C-T01N-SFW, RR-13-D01N-SFW, RR-13-T01N-SFW, RR-14-D01N-SFW, RR-15-T01N-SFW, RR-16-D01N-SFW, RR-16-T01N-SFW, RR-17-D01N-SFW, RR-17-T01N-SFW, RR-18A-D01N-SFW, RR-18A-T01N-SFW, RR-18B-D01N-SFW, RR-18B-T01N-SFW, RRS-1-T02D-PLTF	U MB-I
Copper (MS)	---	0.337	0.30	MSS3-6-T02D-PLTS, RRS-1-T01D-PLTF, RRS-1-T02D-PLTF	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank MB=Method Blank IDL=Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Results for Rinsate Blank

Analyte	MSS3-6-T01D-PLTG (µg/l)	MSS3-6-T02D-PLTS (µg/l)	RRS-1-T01D-PLTF (µg/l)	RRS-1-T02D-PLTF (µg/l)
Aluminum	---	7.1	7.0	29.6
Boron	---	---	---	5.5
Copper	---	1.5	0.85	0.40
Iron	---	---	---	39.4
Lead	---	---	---	0.10
Manganese	---	---	---	3.2
Nickel	0.20	1.3	1.7	2.4
Zinc	12.4	132	10.7	7.1

Table 1.3
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC ICAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
9/10/02 (1113)	Benaldehyde	34.0%	RR-15-T01N-SFW	UJ ICAL-I

Table 1.4
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
10/16/02 (1058)	Benaldehyde 2,4-Dinitrophenol Pentachlorophenol Dibenz (a,h)anthracene	30.6% 33.3% 36.4% 32.6%	RR-15-T01N-SFW	UJ CCAL-I

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT003 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Validationer: A. Watson/S. Coker Date Completed: 11/12/02 and 12/09/02

Peer Reviewer: S.Coker/A. Roberts Date Completed: 12/16/02

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RRS-3-RB02-PLTS	RB	503545		W	X						
RRS-3-RB01-PLTS	RB	503546		W	X						
SPRING12-D01N-GRW	SA	503547		W	X						
SPRING14-D01N-GRW	SA	503548		W	X						
SPRING12-T01N-GRW	SA	503549		W	X	X					
SPRING14-T01N-GRW	SA	503554		W	X	X					
SPRING18-D01N-GRW	SA	503555		W	X						
SPRING15-D01N-GRW	SA	503556		W	X						
SPRING18-T01N-GRW	SA	503557		W	X	X					
SPRING15-T01N-GRW	SA	503558		W	X	X					
SPRING13-D01N-GRW	SA	503559		W	X						
SW12-8-D01N-SFW	SA	503560		W	X						
SPRING13-T01N-GRW	SA	503561		W	X	X					
SW12-8-T01N-SFW	SA	503562		W	X	X					
SPRING17-D01N-GRW	SA	503563		W	X						
SPRING17-T01N-GRW	SA	503564		W	X	X					

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

This package included the ion chromatography (IC) initial calibration data for 10/02/02 and 10/13/02. The initial calibration curve from 10/02/02 was used to calculate the reported sample results. The

10/13/02 curve included in the package was considered invalid and was not saved by the laboratory data system. The 10/13/02 curve included in the package should be disregarded.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3, rather than Nitrate as N. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. Thus, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. However, the error was not discovered until after the results for WAT packages 001 through 009 were reported. The laboratory issued replacement data sheets for data packages WAT001 through WAT009, which were collated into the original data sets. The original nitrate data sheets for the affected packages were marked as superseded. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

During the alkalinity analysis of the samples in this SDG, the associated blank samples yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the concentration was less than the RL listed in the QAPP, and therefore sample results were reported from this analysis. No qualification of the associated data was considered necessary.

The continuing calibration check standards that immediately follow the ICSABs on the ICP/MS instrument consistently yield elevated percent recoveries for aluminum due to carryover from the ICSABs. This issue and data qualification are summarized below.

The ICP/MS continuing calibration check standard associated with this package yielded a selenium percent recovery of 88%, which is marginally below the acceptance range of ±10%. This issue and data qualification are summarized below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	Two sample receipt temperatures were incorrectly written on the log in sheet as 34 C instead of 3, 4 C. BOD and COD analyses were erroneously requested on the COC. However, BOD and COD are not required analysis parameters for groundwater. As such, the associated bottles were not collected. Samples SPRING17-T01N/D01N-GRW originally were recorded on COC as SPRING17-T01N/D01N-SFW. The laboratory logged the samples in as "SFW" samples. The reporting forms and electronic deliverables were corrected by hand.
Holding Times	Yes	
Laboratory Blank Results	No	Aluminum, manganese, and molybdenum, and selenium were detected in various blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Yes	Although there were no project-specific matrix QC samples in this package, the overall matrix QC frequency was met for the Fall 2002 sampling event. The results will be used to formulate the accuracy and precision sections of the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution RRS-3-RB02-PLTS • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses on samples RRS-3-RB02-PLTS, was applicable for 0 out of 24 analytes.. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. For sample MW-13-T01N/D01N-GRW, the percent difference between the anion/cation balance was –32.85, outside the acceptance range of ±13%. Review of the result indicated that the sulfate milliequivalent result on the anion side is higher than the milliequivalent total of the cation results. Review of results from other samples indicates a generally high bias in the sulfate results. The sulfate result has therefore been qualified as "J TvP-H".
Field QC • Field Duplicate • Rinsate Blank RRS-3-RB02-PLTS RRS-3-RB01-PLTS • Field Blank • Trip Blank • Other (e.g. splits)	Yes	There were a few detections in the various field quality control blanks (RB). These are summarized in Tables 1.2. The RB results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	No	In CCV1, the recoveries of aluminum and selenium were outside the acceptance range of 90-110%. Table 1.3 summarizes the results and resultant data qualification.
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Verification	No	Although beryllium for this project was reported from the ICP, the data validationer noted that the ICPMS internal standard, 89Y, used to quantitate 9Be was more that 50 amus from the analyte. For all other elements reported from the ICP/MS, the associated internal standard was within 50 amus of the analyte. As such, this issue is not considered to affect the quality or usability of the data reported from the ICPMS.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	Information regarding the mass resolution is not available due to software limitations. However, acceptable mass resolution can be inferred from the other QC sample results which satisfied evaluation criteria. For the ICPMS analysis of the ICSA solution, antimony, copper and lead were reported as present at a concentration of 1.0 ug/l. However, these analytes are not present in the solution. Although these results suggest a potential high bias in results for these analytes, data qualification was not necessary because none of the samples contained the interferent elements (aluminum and molybdenum) at concentrations comparable to those in the ICS solutions.

Table 1.1
Blank Detections Resulting in Data Qualification

Analyte	MB (ug/l)	CCB1 (ug/l)	CCB4 (ug/l)	RL	Samples Qualified	Qualification Codes
Aluminum (MS)	4.2	---	---	3.0	RRS-3-RB01-PLTS SPRING14-T01N-GRW SPRING14-D01N-GRW SPRING15-D01N-GRW SPRING19-T01N-GRW	U MB - I
Manganese (P)	---	0.9	---	0.7	SPRING12-T01N-GRW	U CCB - I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Positive Results for Rinsate Blanks

Analyte	RRS-3-RB01-PLTS (µg/l)	RRS-3-RB02-PLTS (µg/l)	RL
Antimony	---	0.23	0.20
Chromium	---	2.4	1.9
Zinc	48.6	3.3	2.1

RL = Reporting Limit

Table 1.3
Continuing Calibration Verification Results and Data Qualification

Sample	Analyte	Recovery	Acceptance Limits	Qualified Samples	Qualification Codes
The first CCV in the run	Aluminum	112%	90-110%	SPRING-12-T01N-GRW	Positive results qualified J CCV – H
	Selenium	88%		RSS-3-RB01-PLTS RRS-3-RB02-PLTS SPRING-12-T01N-GRW SPRING-12-D01N-GRW SPRING-14-T01N-GRW SPRING-14-D01N-GRW	Positive results qualified J CCV – L Nondetect results qualified UJ CCV - L

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT004 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 1/20/03

Peer Reviewer: Alan Roberts Date Completed: 1/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RR-12-D01N-SFW	SA	503681		W	X	X					
RR-12-T01N-SFW	SA	503682	RR12T01N-SFW or RR12T01NSFW or RR12-T01NSFW	W	X	X	X	X	X		
RR-11B-D01N-SFW	SA	503683		W	X	X					
RR-11B-T01N-SFW	SA	503684		W	X	X					
RR-11A1-D01N-SFW	SA	503685	R11A1T01NSFW or RR11A1T01NSF	W	X	X					
RR-11A1-T01N-SFW	SA	503686		W	X	X	X	X	X		
RR-10-D01N-SFW	SA	503687		W	X	X					
RR-10-T01N-SFW	SA	503688		W	X	X					
RB01T-SOL	RB	503689		W	X	X					
RR-3-D01N-SFW	SA	503690		W	X	X					
RR-3-T01N-SFW	SA	503691		W	X	X					
RR-10A1-D01N-SFW	SA	503692		W	X	X					
RR-10A1-T01N-SFW	SA	503693		W	X	X					
RR-5-D01N-SFW	SA	503694		W	X	X					
RR-5-T01N-SFW	SA	503695	RR5-T01N-SFW or RR5T01NSFW or RR-55-T01NSFW	W	X	X	X	X	X		
TB01T-SFW	TB	503696		W			X				
TB02T-SFW	TB	503697		W			X				
TB01T-SED	TB	503698		W			X				
TB02T-SED	TB	503699		W			X				

Matrix: W = Water

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC sample is associated with.

[2] Due to limitations of the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, they are identified under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3, rather than Nitrate as N. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. Thus, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. However, the error was not discovered until after the results for WAT packages 001 through 009 were reported. The laboratory issued replacement data sheets for data packages WAT001 through WAT009, which were collated into the original data sets. The original nitrate data sheets for the affected packages were marked as superseded. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

The case narrative indicates that during the alkalinity analysis of the samples in this SDG, the associated blank samples yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the blank sample result was reported as nondetect at a RL of 1mg/L from this analysis. No qualification of the associated data was considered necessary.

The ICP/MS metals analyses of the blank spike duplicate sample yielded a percent recovery for Selenium that was marginally below the laboratory's control limits. The percent recovery is within the limits listed in the project QAPP, therefore no qualification of the associated data was considered necessary.

It was noted in the laboratory case narrative that the semivolatile organic compounds analysis of the blank spike sample S4LCS yielded a slightly elevated percent recovery (99%) of the target compound 4-Nitrophenol. The CLP method does not require the blank spike to be analyzed for the semivolatile organic compounds; however, the laboratory did report these values along with their historical QC limits of 10-80. The blank spike in this analytical set is actually at a higher accuracy than the historical QC limits; therefore no qualifications are necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were two problems that occurred with the sample receipt: The COC accidentally lists two samples with sample ID "TB01T-SFW", while the samples vials were labeled as "TB01T-SFW" and "TB02T-SFW". It was confirmed that the vials were correctly labeled, therefore the laboratory used the field IDs from those vials to log in the samples. No qualification was necessary. A COC entry was accidentally not included for sample "RR-12-T01N-SFW". It was confirmed that this sample was included for analysis, therefore the laboratory ran the sample and noted it on the on the case narrative. No qualification was necessary.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, Orthophosphate, and BOD were not met for some samples. Table 1.1 summarizes the holding time exceedances and the resultant data qualifications. Results for hold time exceedance reflect an indeterminate bias.
Laboratory Blank Results	No	Boron, lead, molybdenum, 1,2-dibromo-3-chloropropanem 1,2,4-trichlorobenzene were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control (QC) samples. The MS results for samples for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-12-D01N-SFW RR-5-T01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery for the explosives analysis was low in sample RR-5-T01N-SFW. The recovery of surrogate compound 1,2-dinitrobenzene was 82%. This recovery is outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Therefore, all positive and non-detect results for sample RR-5-T01N-SFW are qualified as estimated ("J/UJ"). The serial dilution analyses on samples RR-12-D01N-SFW and RR-5-T01N-SFW were applicable for 3 out of 24 analytes. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment.
Field QC • Field Duplicate • Rinsate Blank RB01T-SOL • Field Blank • Trip Blank TB01T-SFW TB02T-SFW TB01T-SED TB02T-SED • Other (e.g., splits)	Yes	There were a few detections in the various field quality control blanks (RB). These are summarized in Tables 1.3. The RB results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. The continuing calibration for VOCs was within the percent recovery, however, the SVOCs were slightly outside of their percent recovery. Table 1.4 summarizes these qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	BOD (mg/L)
RR-12-T01N-SFW	0.45 J	0.005 J	0.010 UJ	1.4 UJ
RR-11B-T01N-SFW	0.41 J	0.006 J	0.010 UJ	1.8 J
RR-11A1-T01N-SFW	0.45 J	0.006 J	0.010 UJ	---
RB01T-SOL	0.20 UJ	---	0.010 UJ	---
RR-3-T01N-SFW	---	0.005 UJ	---	---
RR-10A1-T01N-SFW	---	0.006 J	---	---
RR-5-T01N-SFW	0.50 J	0.008 J	0.041 J	6.8 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Boron (P)	---	19.85	4.8	RR-12-D01N-SFW	U MB-I
Lead (MS)	---	0.348	0.10	RR-11B-T01N-SFW, RR-11A1-T01N-SFW, RB01T-SOL, RR-10A1-D01N-SFW, RR-5-D01N-SFW, RR-5-T01N-SFW	U MB-I
Molybdenum (MS)	0.2	---	0.20	RR-10-T01N-SFW, RR-3-T01N-SFW,	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

[1] Compound is a tentatively identified compound (TIC). TICs in method blanks are not considered to be reportable as TICs for samples.

[2] Compound is a suspected aldol condensation product of acetone.

Table 1.3
Results for Rinsate Blank

Analyte	RB01T-SOL (µg/l)
Aluminum	65.1
Iron	79.8
Vanadium	0.11

Table 1.4
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC CCAL Date/Time	Analyte	% RSD >25%	Action	Qualification and Qualification Codes
10/15/02 (0755)	Benzaldehyde	47.0%	RR-11A1-T01N-SFW, RR-12-T01N-SFW, RR-5-T01N-SFW	UJ CCAL-I
	4-Nitroaniline	32.4%		
	3,3'-Dichlorobenzidine	27.6%		
	Di-n-octylphthalate	-31.4%		

CCAL = Continuing Calibration

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT005ampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 1/21/03

Peer Reviewer: Stacey Coker Date Completed: 1/22/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
SW12-4-T01N-SFW	SA	503864		W	X	X					
SW12-4-D01N-SFW	SA	503865		W	X						
SW12-6-T01N-SFW	SA	503866		W	X	X					
SW12-6-D01N-SFW	SA	503867		W	X						
SW12-5-T01N-SFW	SA	503868		W	X	X					
SW12-5-D01N-SFW	SA	503869		W	X						
RRS-13-T01N-SFW	SA	503870		W	X	X					
RRS-13-D01N-SFW	SA	503871		W	X						
RRS-23-T01N-SFW	SA	503872		W	X	X					
RRS-23-D01N-SFW	SA	503873		W	X						
RRS-27-T01N-SFW	SA	503874		W	X	X					
RRS-27-D01N-SFW	SA	503875		W	X						
SW12-7-T01N-SFW	SA	503876		W	X	X					
SW12-7-D01N-SFW	SA	503877		W	X						
RRS-15-T01N-SFW	SA	503878		W	X	X					
RRS-15-D01N-SFW	SA	503879		W	X						
RR-4-T01N-SFW	SA	503880	RR4-T01N-SFW or RR4T01NSFW or RR-4-T01NSFW	W	X	X	X	X	X		
RR-4-D01N-SFW	SA	503881		W	X						
TB06T-SFW	TB	503882		W			X				
RRS-18-T01N-SFW	SA	503883		W	X	X					
RRS-18-D01N-SFW	SA	503884		W	X						

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC sample is associated with.

[2] Due to limitations of the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, they are identified under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

This package included the ion chromatography (IC) initial calibration data for 10/02/02 and 10/13/02. The initial calibration curve from 10/02/02 was used to calculate the reported sample results. The 10/13/02 curve included in the package was considered invalid and was not saved by the laboratory data system. The 10/13/02 curve included in the package should be disregarded.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3, rather than Nitrate as N. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. Thus, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. However, the error was not discovered until after the results for WAT packages 001 through 009 were reported. The laboratory issued replacement data sheets for data packages WAT001 through WAT009, which were collated into the original data sets. The original nitrate data sheets for the affected packages were marked as superseded. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

The alkalinity blank sample analysis of the samples in this SDG, yielded a concentration that was marginally above the laboratory's reporting limit (RL). However, the blank sample result was below the QAPP required RL. As such, the run was considered acceptable. No qualification of the associated data was necessary, based on the alkalinity detected in the method blank.

The continuing calibration check standards that immediately follow the ICSABs on the ICB/MS instrument consistently yielded elevated percent recoveries for aluminum due to carryover from the ICSABs. The laboratory was given permission to use these elevated recoveries since this issue will persist throughout the project. No qualification of the associated data was considered necessary.

The nitroaromatics analysis of laboratory control sample yielded a slightly low percent recovery (LCS=60%, LCSD=60%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, orthophosphate, and BOD. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, boron, iron, lead, molybdenum, and 1,2,4-trichlorobenzene were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control (QC) samples. The MS results for samples for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution SW12-4-T01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution test for sample SW12-4-T01N-SFW was applicable for 6 of the 24 metals. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. For samples SW12-6-T01N-SFW and RR-18-T01N-SFW the partial analysis of orthophosphate exceeded that of the total analysis of phosphorus did not meet acceptance criteria. Table 1.3 summarizes these results and the data qualifications.
Field QC • Field Duplicate RRS-18-T01D-SFW RRS-18-D01D-SFW • Rinsate Blank • Field Blank • Trip Blank TB06TSFW • Other (e.g., splits)	No	This package was combined with WAT006 to analyze field duplicate (FD) samples. Some of these samples were slightly outside the control criteria as summarized in Table 1.4. The field quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	The LCS results for explosives were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. The continuing calibration for VOCs and SVOCs were slightly outside of their percent recoveries. Table 1.5 summarizes continuing calibration detections and the resultant data qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	BOD (mg/L)
SW12-4-T01N-SFW	0.50 UJ	0.005 UJ	0.016 J	---
SW12-6-T01N-SFW	0.50 UJ	0.005 UJ	0.039 J	---
SW12-5-T01N-SFW	0.50 UJ	0.005 UJ	0.10 UJ	---
RRS-13-T01N-SFW	0.50 UJ	0.005 UJ	0.021 J	1.3 UJ
RRS-23-T01N-SFW	0.50 UJ	0.005 UJ	0.025 J	1.3 UJ
RRS-27-T01N-SFW	0.50 UJ	0.005 UJ	0.022 J	1.3 UJ
SW12-7-T01N-SFW	0.50 UJ	0.005 UJ	0.010 UJ	---
RRS-15-T01N-SFW	0.50 UJ	0.005 UJ	0.016 J	1.3 UJ
RR-4-T01N-SFW	0.50 UJ	0.005 UJ	0.012 J	1.3 UJ
RRS-18-T01N-SFW	0.50 UJ	0.005 UJ	0.031 J	1.3 UJ

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (MS)	5.6	---	---	6.943	3.0	RRS-15-D01N-SFW, RRS-18-T01N-SFW, RRS-23-T01N-SFW, RRS-27-T01N-SFW, SW12-6-D01N-SFW, SW12-7-D01N-SFW	U CCB-I U MB-I
Boron (P)	---	---	4.9	17.61	4.8	SW12-4-T01N-SFW, SW12-4-D01N-SFW, SW12-5-D01N-SFW	U CCB-I U MB-I
Lead (MS)	---	---	---	3.981	0.10	RR-4-T01N-SFW, RRS-13-T01N-SFW, RRS-15-T01N-SFW, RRS-23-T01N-SFW, RRS-23-D01N-SFW, RRS-27-T01N-SFW, SW12-4-T01N-SFW, SW12-5-T01N-SFW, SW12-5-D01N-SFW, SW12-7-T01N-SFW	U MB-I
Molybdenum (MS)	0.2	0.3	---	---	0.20	RRS-23-T01N-SFW, RRS-23-D01N-SFW, RRS-27-T01N-SFW, RRS-27-D01N-SFW, RRS-13-T01N-SFW, RRS-13-D01N-SFW, RRS-15-T01N-SFW, RRS-15-D01N-SFW, SW12-4-T01N-SFW, SW12-4-D01N-SFW, SW12-5-T01N-SFW, SW12-5-D01N-SFW, SW12-6-T01N-SFW. SW12-6-D01N-SFW, SW12-7-T01N-SFW, SW12-7-D01N-SFW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Absolute Difference	RL	Action
SW12-6-T01N-SFW Orthophosphate vs. Phosphorus	0.103	0.010	Results for these analytes in the SW12-6-T01N-SFW and RR-18-T01N-SFW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
RR-18-T01N-SFW Orthophosphate vs. Phosphorus	0.02		

Table 1.4
Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	RRS-18-T01N-SFW	RRS-18-T01D-SFW	Criteria Comment	Outside Criteria	RL	Action
Orthophosphate (mg/l)	0.031	0.01	Abs. Diff. <2xRL (0.02)	Abs Diff.=0.021	0.01	UJ/J FD-L parents
Iron (µg/l)	497	22.6	Abs. Diff. <2xRL (45.2)	Abs Diff.=474.4	22.6	UJ/J FD-L parents

Table 1.5
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
10/10/02 (0903)	Chloroethane	-27.0%	RR-4-T01N-SFW, TB06T-SFW	J/UJ CCAL-I
	Acetone	48.0%		
	2-Butanone	27.7%		
	2-Hexanone	31.4%		
	2-Butanone	37.6%		
	2-Hexanone	35.8%		
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
10/15/02 (0755)	Benzaldehyde	47.0%	RR-4-T01N-SFW	
	4-Nitroaniline	32.4%		
	3,3'-Dichlorobenzidine	27.6%		
	Di-n-octylphthalate	-31.4%		

CCAL = Initial Calibration %D = Percent Difference

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT006 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Laboratory Reviewer: Karen Kronoveter Date Completed: 05/30/03

Data Validationer: Ansley Watson Date Completed: 1/15/03

Peer Reviewer: Alan Roberts Date Completed: 1/20/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Pesticides	Explosives	PCBs
RRS-18-T01D-GRW	FD	503904		W	X	X					
RRS-18-D01D-GRW	FD	503905		W	X						
RB01T-SOL	RB	503906		W	X	X					
RR-5-FB01T-SFW 10/3	FB	503907	RR5FB01T-SFW	W			X	X		X	
RR-5-FB01T-SFW 10/6	FB	503908	RR5FB01TSFW	W					X		
TB01T-SFW 10/3	TB	503909	TB01TSFW1003	W			X				
TB05T-SFW	TB	503910		W			X				
RR-6A-T01N-SFW	SA	503911	RR6AT01N-SFW	W	X	X	X	X		X	
RR-6A-D01N-SFW	SA	503912		W	X						
RR-6-T01N-SFW	SA	503913	R6T01NSFW	W	X	X	X	X		X	
RR-6-D01N-SFW	SA	503914		W	X						
TB01T-SFW 10/4	TB	503915	TB01TSFW1004	W			X				
RR-1-T01N-SFW	SA	503916		W	X	X					
RR-1-D01N-SFW	SA	503917		W	X						
Capulin Spring-T01N-GRW	SA	503918	CAPULIN SPG-T01N-GRW	W	X	X					
Capulin Spring-D01N-GRW	SA	503919	CAPULIN SPG-D01N-GRW CAPULIN	W	X						
SW12-10-T01N-SFW	SA	503920		W	X	X					
SW12-10-D01N-SFW	SA	503921		W	X						
SW12-9-T01N-SFW	SA	503922		W	X	X					
SW12-9-D01N-SFW	SA	503923		W	X						
TB02T-SFW	TB	503924		W			X				
RR-8-T01N-SFW	SA	503925	RR8-T01N-SFW	W	X	X	X	X		X	
RR-8-D01N-SFW	SA	503926		W	X						
TB08T-SFW	TB	503927		W			X				
RR-7-T01N-SFW	SA	503928	RR7-T01N-SFW	W	X	X	X	X		X	
RR-7-D01N-SFW	SA	503929		W	X						

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC sample is associated with.

[2] Due to limitations of the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, they are identified under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

This package included the ion chromatography (IC) initial calibration data for 10/02/02 and 10/13/02. The initial calibration curve from 10/02/02 was used to calculate the reported sample results. The 10/13/02 curve included in the package was considered invalid and was not saved by the laboratory data system. The 10/13/02 curve included in the package should be disregarded.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3, rather than Nitrate as N. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. Thus, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. However, the error was not discovered until after the results for WAT packages 001 through 009 were reported. The laboratory issued replacement data sheets for data packages WAT001 through WAT009, which were collated into the original data sets. The original nitrate data sheets for the affected packages were marked as superseded. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

The case narrative indicates that during the alkalinity analysis of the samples in this SDG, the associated blank samples yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the blank sample result was reported as nondetect at a RL of 1mg/L from this analysis. No qualification of the associated data was considered necessary.

During the metals analysis, sample CAPULIN SPG-T01N-GRW and CAPULIN SPG-D01N-GRW displayed a severe interference that affected molybdenum, antimony, manganese, zinc, and selenium. It was necessary to report these elements from the trace ICPs at various dilutions instead of an ICP/MS analysis. Manganese and zinc for ICP/MS did not compare well with the other analytical runs performed. The data from all analyses have been provided in the raw data section of the SDG. No qualification of the reported data was considered necessary since the results are reported from the trace ICP.

A volatile organic holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and is labeled HBW010. Please note that analysis of this holding blank and its associated blank spike yielded percent recoveries of the surrogate monitoring compound 1,2-dichloroethene-d4 that slightly exceeded control criteria. No target analytes were detected in this holding blank. No qualification of associated sample results was considered necessary.

It was noted in the laboratory case narrative that the semivolatile organic compounds analysis of the blank spike sample S4LCS yielded a slightly elevated percent recovery (99%) of the target compound 4-Nitrophenol. The CLP method does not require the blank spike to be analyzed for the semivolatile organic compounds, however, the laboratory did report these values along with their historical QC limits of 10-80. The blank spike in this analytical set is actually at a higher accuracy than the historical QC limits; therefore no qualifications are necessary.

During the pesticides analysis of the samples in this delivery group, the resolution between the target compounds 4,4'DDE and endosulfan was below the control criteria. However, these compounds were not detected in any of the associated samples, and therefore no further action was taken. No qualification of the associated data was considered necessary.

The pesticide data for methoxychlor was evaluated to a level below the laboratory's normal reporting limit (RL=500) to meet the client's requested reporting limit (QAPP RL ≤ 100µg/L). Methoxychlor was not detected in any of the samples in this SDG. The laboratory's normal reporting limit is listed on the reporting forms.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample receiving forms noted four issues with sample receipt: • Capulin Spring-T01N-GRW and Capulin Spring-D01N-GRW were truncated to Capulin SPG-T01N-GRWand Capulin SPG-D01N-GRW. The cooler containing sample RR-6-T01N-SFW was received with bottles for COD analysis, however, the COC was not marked for the COD analysis. The laboratory was notified by fax to run COD analysis on the RR-6-T01N-SFW sample. The cooler containing sample RR-5-FB01T-SFW was received with bottles for TOC analysis, however, the COC was not marked for the TOC analysis. The laboratory was notified by fax to run TOC analysis on the RR-5-FB01T-SFW sample. The laboratory noted a lack of adequate preservative in sample Capulin SPG-T01N-GRW that resulted in a possible loss of cyanide, therefore the cyanide result for this sample is estimated "UJ" for this nondetects. The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, Orthophosphate, and BOD were not met. Table 1.1 summarizes the holding time detections and the resultant data qualifications. Results for hold time reflect an indeterminate bias.
Laboratory Blank Results	No	Aluminum, antimony, copper, manganese, zinc, and 1,2,4-trichlorobenzene were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS RR-6-T01N-SFW RR-6-D01N-SFW • LD RR-6-T01N-SFW RR-6-D01N-SFW	No	For matrix spike (MS) analysis on samples RR-6-T01N-SFW and RR-6-D01N-SFW, the recoveries of hydroxide alkalinity, bicarbonate alkalinity, selenium, and PYX were low. Similarly, the recoveries for copper in sample RR-6-T01N-SFW and RR-6-D01N-SFW were high. Table 1.3 summarizes these matrix spike results. The MS results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For post digestion spike analysis on sample RR-6-D01N-SFW, the recovery of selenium was low. Table 1.3 summarizes these post digestion spike results and the resultant data qualifications. The post digestion spike results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For laboratory duplicate (LD) analysis of sample RR-6-T01N-SFW and RR-6-D01N-SFW, the fluoride, and copper results did not meet acceptance criteria. Table 1.4 summarizes these results. The LD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution RR-6-T01N-SFW RR-6-D01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery for the volatile organic compound analysis was high in sample TB01T-SFW 1003. The recovery of surrogate compound 1,2chloroethane-d4 was 119%. This recovery is outside the acceptance range of 76%-114%, suggesting a potential high bias in the associated sample results. All of the associated data was nondetect, therefore no qualification was necessary. The serial dilution test for sample RR-6-T01N-SFWL was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 7 of the 24 metals. For each of these 7 metals, the % difference between the original and five-fold diluted results was ≤ 10%. As such, data qualification was not necessary. The serial dilution test for sample RR-6-D01N-SFWL was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 3 of the 24 metals. For each of these 3 metals, the % difference between the original and five-fold diluted results was ≤ 10%. As such, data qualification was not necessary. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. Recoveries for internal standards Y and Tb were high for the ICPMS analysis of samples Capulin SPG-T01N-GRW and Capulin SPG-D01N-GRW. However, the molybdenum, barium, cadmium, and antimony in these samples were reanalyzed and reported by trace ICP, therefore no qualification was necessary. For sample Capulin SPG-T01N/D01N-GRW the absolute value of the percent difference between the anion/cation balance was high. The percent difference was –66.96 outside the acceptance range of ±13%. The pH of sample Capulin SPG-T01N/D01N-GRW was 2.89. Evaluations of the results relative to TDS, specific conductivity, and speciation of the sulfate ion at low pH indicates that the sample analyses were likely biased high. Therefore the sulfate result for that sample was qualified as J TvP-H. All of the alkalinity results for sample SW-12-9-T01N-SFW were qualified as estimated (J/UJ TvP-I) because the sum of the alkalinity forms was greater than the total alkalinity results.
Field QC • Field Duplicate RRS-18-T01N/D-SFW RRS-18-D01N/D-SFW • Rinsate Blank RB01T-SOL • Field Blank RR-5-FB01T-SFW 10/3 RR-5-FB01T-SFW 10/6 • Trip Blank TB01T-SFW 10/3 TB05T-SFW TB01T-SFW 10/4 TB02T-SFW TB08T-SFW • Other (e.g., splits)	No	This package included field duplicate (FD) samples that were slightly outside the control criteria as summarized in Table 1.5. This package included rinsate blanks (RB) samples that were slightly outside the control criteria as summarized in Table 1.6. The field quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness and it was noted in the inorganics that phosphorus was accidentally written as phosphate. The phosphate line was crossed out and correctly revised by hand on the original form 1.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	No	Two continuing calibration verification events were associated with the analysis of the semivolatile data in this package (10/15/02 at 07:55, and 10/16/02 at 10:47). Benzaldehyde was recovered in both continuing calibration verifications at 47.0% and 45.7%, respectively. Accordingly, benzaldehyde in all samples were qualified as estimated (J/UJ) with an indeterminate bias direction and a qualifier code of "CCAL". In addition, 4-Nitroanaline and Di-n-octylphthalate was recovered in the first calibration event (10/15/02) at 32.4% and –31.4%, respectively. As such, all 4-Nitroanaline and Di-n-octylphthalate results in samples associated with this calibration verification event were qualified as estimated (J/UJ) with an indeterminate bias direction and qualifier code of "CCAL". Tables 1.7 summarizes the continuing calibration results that were outside the evaluation criteria and assigned data qualifications.
Laboratory Control Sample Results	No	The laboratory case narrative noted the nitroaromatics analysis of the blank spike samples D1LCS and D1LCSD yielded slightly low percent recoveries for PYX (60% for both). Due to the fact that the laboratory has not yet established control limits for this compound, the default criteria of 70-130% was applied. Since the LCS and LCSD recoveries were less than the lower limit but > than 10%, PYX results in all samples was qualified as estimated (UJ) with a low bias direction.
Compound Identification	Yes	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Yes	Information regarding the mass calibration and resolution are not available due to the software limitations. However, acceptable performance can be inferred from the other QC sample results, which satisfied evaluation criteria. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	BOD (mg/L)
RRS-18-T01D-SFW	0.50 UJ	0.005 UJ	0.010 UJ	0.005 UJ
RB01T-SOL	0.50 UJ	---	---	---
RR-6A-T01N-SFW	0.50 UJ	0.005 UJ	0.010 UJ	1.3 UJ
RR-6-T01N-SFW	0.50 UJ	0.005 UJ	0.025 J	1.3 UJ
RR-1-T01N-SFW	0.50 UJ	0.005 UJ	0.010 UJ	1.3 UJ
CAPULINSPG-T01N-GRW	2.0 UJ	0.26 J	9.6 J	---
SW12-10-T01N-SFW	0.50 UJ	0.005 UJ	0.010 UJ	---
SW12-9-T01N-SFW	0.50 UJ	0.005 UJ	0.010 UJ	1.3 UJ
RR-8-T01N-SFW	0.50 UJ	0.005 UJ	0.018 J	1.3 UJ
RR-7-T01N-SFW	0.50 UJ	0.005 UJ	0.018 J	1.3 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	RL	Samples Qualified	Qualification Code
Aluminum (P)	---	---	---	---	---	43.598	3.00	RRS-18-T01N-SFW, RRS-18-D01N-SFW, RB01T-SOL, RR-1-D01N-SFW	U MB-I
Antimony (MS)	0.2 1.0	 0.8	0.2 0.4	0.3 0.4	0.3 0.3	---	0.20	RRS-18-T01N-SFW, RR-6-D01N-SFW	U CCB-I
Copper (MS)	---	---	---	---	---	0.569 0.357 0.957	0.30	RRS-18-T01N-SFW, RRS-18-D01N-SFW, RR-6A-D01N-SFW, RR-1-T01N-SFW, SW12-10-T01N-SFW, SW12-10-D01N-SFW, SW12-9-T01N-SFW, SW12-9-D01N-SFW, RR-8-D01N-SFW, RR-7-D01N-SFW	U MB-I
Manganese (P)	---	---	10.4	3.9	2.7	---	2.5	RRS-18-T01N-SFW, RRS-18-D01N-SFW, RR-1-T01N-SFW	U CCB-I
Zinc (P)	---	---	9.3	---	---	---	6.9	RR-6A-T01N-SFW, RR-6A-D01N-SFW, RR-6-D01N-SFW, SW12-10-D01N-SFW, SW12-9-T01N-SFW, SW12-9-D01N-SFW, RR-8-T01N-SFW, RR-8-D01N-SFW, RR-7-D01N-SFW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
MS, MSD, and PDS Recoveries Not Meeting Criteria

Sample/Analytes	Matrix Spike Recovery	Matrix Spike Duplicate Recovery	Post digestion Spike Recovery	Acceptance Limits	Action
RR-6-T01N-SFW					
Copper	126.3%	NA	NA	75-125%	Qualify parent sample J MS-H
PYX	32%	28%	NA	70-130%	Qualify parent sample UJ MS-L
RR-6-D01N-SFW					
Selenium	72.3%	NA	NA	75-125%	Qualify parent sample UJ MS-L

NA = Not appropriate

ND = Nondetect

RL = Reporting limit (generally the IDL adjusted for dilution)

IDL = Instrument detection limit

Table 1.4
Laboratory Duplicate Qualifications

Sample/Analyte	Absolute Difference	1xRL	Action
RR-6-T01N-SFW Fluoride	0.23	0.20	No qualification because sample and laboratory duplicate concentrations were qualified as nondetect due to rinsate blank qualification during overall assessment.
Sample/Analyte	**RPD**	**RL**	**Action**
RR-6-D01N-SFW Copper	20.4	0.3	No qualification because 20.4 rounds to 20% which is within QC limits.

Table 1.5
Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	RRS-18-T01N-SFW	RRS-18-T01D-SFW	Criteria Comment	Outside Criteria	RL	Action
Orthophosphate (mg/l)	0.031	0.01	Abs. Diff. <2xRL (0.02)	Abs Diff.=0.021	0.01	UJ/J FD-L parents
Iron (µg/l)	497	22.6	Abs. Diff. <2xRL (45.2)	Abs Diff.=474.4	22.6	UJ/J FD-L parents

Table 1.6
Rinsate Blanks

Analyte	RB01T-SOL (µg/l)
Phosphate	0.033

Table 1.7
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% RSD >25%	Action	Qualification and Qualification Codes
VOC	10/10/02 (0903)	Bromomethane	-42.9%	Results for these analytes in associate samples were qualified as estimated	UJ CCAL-I
		Acetone	48%		
		2-Butanone	27.7%		
		2-Hexanone	31.4%		
VOC	10/14/02 (0852)	Acetone	49.0%	No samples were associated with this calibration event, therefore no qualification was necessary	---
		2-Butanone	37.6%		
		2-Hexanone	35.8%		
SVOC	10/15/02 (0755)	Benzaldehyde	47.0%	No samples were associated with this calibration event, therefore no qualification was necessary	---
		4-Nitroaniline	32.4%		
		Di-n-octylphthalate	-31.4%		
SVOC	10/16/02 (1047)	Benzaldehyde	45.7%	Results for this analyte in associated samples was qualified as estimated	UJ CCAL-I

CCAL = Initial Calibration %D = Percent Difference

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT007 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 12/4/02

Peer Reviewer: Alan Roberts Date Completed: 1/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RB01T-SFW	RB	504059	RB01TSFW	W	X	X	X	X	X		
RB01D-SFW	RB	504060		W	X						
TB03T-SFW	TB	504061		W			X				
RR-8A-T01N-SFW	SA	504062		W	X	X					
RR-8A-D01N-SFW	SA	504063		W	X						
RRS-20-T01N-SFW	SA	504064		W	X	X					
RRS-20-D01N-SFW	SA	504065		W	X						
RS-6-RB01-PLTF	RB	504066		W	X						
RS-6-RB02-PLTS	RB	504067		W	X						
TB05T-SED	TB	504068		W			X				
TB01T-SED	TB	504069		W			X				
TB01-SED	TB	504070		W			X				
TB04T-SFW	TB	504071		W			X				
GOATHILL SPG-T01N-GRW	SA	504256		W	X	X					
GOATHILL SPG-D01N-GRW	SA	504257		W	X						
RRS-13-T01N-SFW	SA	504258		W		X [3]					
RRS-12-T01N-SFW	SA	504259		W	X	X					
RRS-12-D01N-SFW	SA	504260		W	X						
ERLIN-T01N-SFW	SA	504261		W	X	X					
ERLIN-D01N-SFW	SA	504262		W	X						
ERLMID-T01N-SFW	SA	504263	ERLMIDT01NSFW or ERLMIDT01NSF	W	X	X	X	X	X		
ERLMID-D01N-SFW	SA	504264		W	X						
TB12T-SFW	TB	504265		W			X				
ZWERGEL-T01N-SFW	SA	504566	ZWERGELT01NSFW or ZWERGELT01NS	W	X	X	X	X	X		
ZWERGEL-D01N-SFW	SA	504567		W	X						
TB13T-SFW	TB	504568		W			X				

Matrix: W = Water

SA = Sample TB = Trip Blank RB = Rinsate Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC sample is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, they are identified under the CLP form Field ID.

[3] TOC analyses only.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary:

This package included the ion chromatography (IC) initial calibration data for 10/02/02 and 10/13/02. The initial calibration curve from 10/02/02 was used to calculate the reported sample results. The 10/13/02 curve included in the package was considered invalid and was not saved by the laboratory data system. The 10/13/02 curve included in the package should be disregarded.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3, rather than Nitrate as N. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. Thus, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. However, the error was not discovered until after the results for WAT packages 001 through 009 were reported. The laboratory issued replacement data sheets for data packages WAT001 through WAT009, which were collated into the original data sets. The original nitrate data sheets for the affected packages were marked as superseded. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

The original Total Dissolved Solids analysis of sample Goathill SPG-T01N-GRW, which was performed within holding time, yielded a net weight after drying that greatly exceeded the upper limit of the method. This sample was re-analyzed using a smaller sample volume outside of holding time yielding results comparable to the original analysis, therefore, this sample will be qualified as estimated (“J”/”UJ”).

During the metals analysis, sample Goathill SPG-T01N-GRW and Goathill SGP-D01N-GRW displayed a severe negative interference for Sodium on the trace ICP instrument. These samples were re-analyzed at a ten-fold dilution to reduce the interference so that the true sodium concentration could be ascertained. This analysis yielded a concentration of Sodium that was marginally above the instrument detection limit and has been formally reported. It was also necessary to report Molybdenum for these samples from a trace ICP analysis due to severe interference (high internal standard recovery) on the ICP/MS instrument that affected Molybdenum. No qualification of the associated data was considered necessary.

The ICP/MS metals analyses of the continuing calibration check standards associated with this sample delivery group (SDG) yielded percent recoveries for Selenium that were below the established control limits. Since the recovery was greater than 85 percent, no qualification in associated data was considered necessary. Additionally, the blank spike analysis designated as LCSW1023B exhibited a percent recovery for selenium that was below the laboratory’s control limits. However, the recovery is within the limits set forth in the project QAPP. No qualification of the associated data was considered necessary.

A volatile organic compounds holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank has been included in the data package and is labeled as HBW007.

It was noted in the laboratory case narrative that the semivolatile organic compounds analysis of the blank spike sample S4LCS yielded a slightly elevated percent recovery (98%) of the target compound 4-Nitrophenol. The CLP method does not require the blank spike to be analyzed for the semivolatile

organic compounds, however, the laboratory did report these values based on their historical QC limits of 10-80. The blank spike in this analytical set is actually at a higher accuracy than the historical QC limits; therefore no qualifications are necessary.

It was noted in the laboratory case narrative that the nitroaromatics analysis of blank spike samples D1LCS and D1LCSD yielded a slightly lower percent recovery (LCS=60%, LCSD=60%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore they used the default criteria of 70-130. Since the LCS recovery is less than the lower limit but >10%, the associated sample result have been qualified as estimated ("UJ"/"J").

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	TB04T-SFW was received but was not listed on any COC; sample was logged in and analyzed. Goathill Spring-T01N-GRW and Goathill Spring-D01N-GRW were truncated to Goathill SPG-T01N-GRWand Goathill SPG-D01N-GRW. The lack of preservative in samples Goathill SPG-T01N-GRW resulted in a possible degradation of cyanide, therefore these samples are estimated "J" for positive results and "UJ" for nondetects. The laboratory did add additional NaOH and ascorbic acid to this sample to adjust the pH.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, Orthophosphate, and BOD. Table 1.1 summarizes the holding time detections and the resultant data qualifications. Results for hold time reflect an indeterminate bias.
Laboratory Blank Results	No	Aluminum, Antimony, Beryllium, and Zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned. In the negative results with potential low bias, concentrations that produce more than 25% effect on a reported sample or sample reporting limit will be qualified as estimated ("J/UJ").
Matrix QC • MS/MSD/PDS ERLIN-T01N-SFW ERLIN-D01N-SFW • LD ERLIN-T01N-SFW ERLIN-D01N-SFW	No	For matrix spike (MS) analysis on sample ERLIN-T01N-SFW, the recoveries of hydroxide alkalinity, and cyanide were low. Table 1.3 summarizes these matrix spike results. The MS results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For laboratory duplicate (LD) analysis of sample ERLIN-D01N-SFW, the lead results did not meet acceptance criteria. Table 1.4 summarizes these results. The LD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution ERLIN-T01N-SFW ERLIN-D01N-SFW • Internal Standards Goathill SPG-T01N-GRW Goathill SPG-D01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution test for sample ERLIN-T01N-SFW was applicable for 4 of the 24 metals. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. Recoveries for internal standard Y was high for the ICPMS analysis of samples GOATHILL SPG-T01N-GRW and GOATHILL SPG-D01N-GRW. However, these molybdenum in these samples were reanalyzed and reported by trace ICP, therefore no qualification was necessary. For sample GOATHILL SPG-T01N/D01N-GRW the absolute value of the percent difference for the anion/cation balance was –43.81 outside the acceptance range of ±13%. The pH of the sample was 2.93. Evaluations of the results relative to TDS, specific conductivity, and speciation of the sulfate ion at low pH indicates that the sulfate analyses were likely biased high. Therefore, the sulfate result for that sample was qualified as J TvP-H.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank RB01T-SFW RB01D-SFW RS-6-RB01-PLTF RS-6-RB02-PLTS • Field Blank • Trip Blank TB03T-SFW TB05T-SED TB01T-SED TB01-SED TB04T-SFW TB12T-SFW TB13T-SFW • Other (e.g., splits)	No	There were a few detections in the rinsate blanks (RB) associated with samples. These are summarized in Table 1.4. The RB results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. Table 1.6 summarizes continuing calibration detections and the resultant data qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package. The volatile organic analyses for sample TB03T-SFW, TB05T-SED, TB01-SED, and TB04T-SFW were performed outside the twelve-hour analytical window due to a malfunction in the laboratory equipment. The samples could not be re-analyzed due to insufficient sample volume. Since these samples only slightly exceeded the 12-hour window, no qualification was considered necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	BOD (mg/L)
RB01T-SFW	0.50 UJ	0.005 UJ	0.010 UJ	1.3 UJ
RR-8A-T01N-SFW	0.50 UJ	0.005 UJ	0.010 UJ	1.3 UJ
RRS-20-T01N-SFW	0.50 UJ	0.005 UJ	0.013 UJ	1.3 UJ
Goathill SPG-T01N-GRW	2.0 UJ	0.063 J	NA	NA
RRS-12-T01N-SFW	0.20 UJ	0.005 UJ	0.010 UJ	1.3 UJ
ERLIN-T01N-SFW	0.36 J	0.005 UJ	0.010 UJ	1.3 UJ
ERLMID-T01N-SFW	0.34 J	0.005 UJ	0.010 UJ	1.3 UJ
ZWERGEL-T01N-SFW	0.20 UJ	0.005 UJ	0.010 UJ	1.3 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	MB2 (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (MS)	3.4	U	3.1					3.0	RB01T-SFW, RRS-20-D01N-SFW, RS-6-RB01-PLTF, ZWERGEL-T01N-SFW	U CCB-I
Chromium (MS)						0.610	0.260	0.10	RB01T-SFW, RB01D-SFW, RR-8A-T01N-SFW, RR-8A-D01N-SFW, RRS-20-T01N-SFW, RRS-20-D01N-SFW, RS-6-RB01-PLTF, RS-6-RB02-PLTS, RRS-12-T01N-SFW, RRS-12-D01N-SFW, ERLIN-T01N-SFW, ERLIN-D01N-SFW, ERLMID-T01N-SFW, ERLMID-D01N-SFW, ZWERGEL-T01N-SFW, ZWERGEL-D01N-SFW	U MB-I
Copper (MS)						0.751		0.30	RB01T-SFW, RR-8A-D01N-SFW, RRS-20-T01N-SFW, RRS-20-D01N-SFW, RS-6-RB02-PLTS, RRS-12-T01N-SFW, RRS-12-D01N-SFW, ERLMID-D01N-SFW, ZWERGEL-T01N-SFW ZWERGEL-D01N-SFW	U MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	MB2 (µg/l)	IDL	Samples Qualified	Qualification Code
Zinc (P)	-4.5	-4.0	-3.5	-4.0	-3.8			2.1	RB01T-SFW, RB01D-SFW, RR-8A-T01N-SFW, RR-8A-D01N-SFW, RRS-20-T01N-SFW, RRS-20-D01N-SFW, RS-6-RB01-PLTF, RS-6-RB02-PLTS, ZWERGEL-T01N-SFW, ZWERGEL-D01N-SFW	UJ or J CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

.[1] Compound is a tentatively identified compound (TIC). TICs in method blanks are not considered to be reportable as TICs for samples.

[2] Compound is a suspected aldol condensation product of acetone.

Table 1.3
Matrix Spike Results for Metals and Inorganics

Sample/ Analytes	Matrix Spike Recovery	Matrix Spike Duplicate Recovery	Post Digestion Spike Recovery	Acceptance Limits	Action
ERLIN-T01N-SFW					
Hydroxide Alkalinity	1.0%	NA	NA	75-125	Acidic nature of sample neutralizes the alkalinity spike resulting in reduced recovery, no qualification
Cyanide	50.6%	NA	NA		Qualify parent sample UJ MS-L

NA = Not appropriate

ND = Nondetect

RL = Reporting limit (generally the IDL adjusted for dilution)

IDL = Instrument detection limit

Table 1.4
Duplicate Qualifications

Sample/Analytes	Absolute Difference between SA and LD	CRDL	Action
ERLIN-D01N-SFW			
Lead	2.3	2	Qualify parent sample UJ D-H

Table 1.5
Rinsate Blanks

Analyte	RB01T-SFW (µg/l)	RB01D-SFW (µg/l)	RS-6-RB01-PLTF (µg/l)	RS-6-RB01-PLTF (µg/l)
TDS	8.0	NA	NA	NA
TSS	4.8	NA	NA	NA
Ammonia-Nitrogen	0.038	NA	NA	NA
Antimony	0.53	NA	NA	NA
Zinc	NA	NA	NA	35.7
Chloroform	3	NA	NA	NA

Table 1.6
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
10/10/02 (0903)	Chloroethane Acetone 2-Butanone 2-Hexanone	-27.0% 48.0% 27.7% 31.4%	RB01T-SFW, TB03T-SFW, TB05T-SED, TB01-SED, TB04T-SFW	UJ CCAL-I
10/14/02 (0852)	Acetone 2-Butanone 2-Hexanone	49.0% 37.6% 35.8%	ERLIMID-T01N-SFW, TB12T-SFW, ZWERGEL-T01N-SFW, TB13T-SFW	UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
10/16/02 (1047)	Benzaldehyde 4-Nitroaniline Di-n-octylphthalate	47.0% 32.4% -31.4%	RB01T-SFW, ERLMID-T01N-SFW, ZWERGEL-T01N-SFW	UJ CCAL-I

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT008 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Validationer: Ansley Watson Date Completed: 12/15/02

Peer Reviewer: Alan Roberts Date Completed: 1/15/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RRS-9-T01N-SFW	SA	504375		W	X	X					
RRS-9-D01N-SFW	SA	504376		W	X	X					
RB01T-SFW	RB	504377		W	X	X					
RB01D-SFW	RB	504378		W	X	X					
ERLOUT-T01N-SFW	SA	505379		W	X	X					
ERLOUT-D01N-SFW	SA	504380		W	X	X					
ERLOUT-T01D-SFW	FD	504381		W	X	X					
ERLOUT-D01D-SFW	FD	504382		W	X	X					
RS-14-RB01-PLTF	RB	504383		W	X	X					
RS-14-RB02-PLTS	RB	504384		W	X	X					
RS-20-RB01-PLTS	RB	504385		W	X	X					
RS-20-RB02-PLTF	RB	504386		W	X	X					
TB11T-SED	TB	504387		W			X				
TB16T-SED	TB	504388		W			X				
UFLMID-T01N-SFW	SA	504702	FLMIDT01NSFW or UFLMIDT01NSF	W	X	X	X	X	X		
UFLMID-D01N-SFW	SA	504703		W	X	X					
TB14T-SFW	TB	504704		W			X				
UFLIN-T01N-SFW	SA	504705		W	X	X					
UFLIN-D01N-SFW	SA	504706		W	X	X					
SPRING39-T01N-SRW	SA	504707		W	X	X					
SPRING39-D01N-SRW	SA	504708		W	X	X					
CAPULIN1-T01N-GRW	SA	504709		W	X	X					
CAPULIN1-D01N-GRW	SA	504710		W	X	X					

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC sample is associated with.

[2] Due to limitations of the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, they are identified under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

This package included the ion chromatography (IC) initial calibration data for 10/02/02 and 10/13/02. The initial calibration curve from 10/02/02 was used to calculate the reported sample results. The 10/13/02 curve included in the package was considered invalid and was not saved by the laboratory data system. The 10/13/02 curve included in the package should be disregarded.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3, rather than Nitrate as N. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. Thus, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. However, the error was not discovered until after the results for WAT packages 001 through 009 were reported. The laboratory issued replacement data sheets for data packages WAT001 through WAT009, which were collated into the original data sets. The original nitrate data sheets for the affected packages were marked as superseded. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

During the alkalinity analysis of the samples in this SDG, the associated blank samples yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the concentration was less than the RL listed in the QAPP, and therefore sample results were reported from this analysis. No qualification of the associated data was considered necessary.

The replicate analyses associated with sample RRS-9-T01N-SFW yielded Relative Percent Difference (RPD) for total phosphorus and TOC that exceeded control criteria. The absolute difference of the sample and duplicate were less than 1xRL, as stated in the QAPP, therefore no qualification of the associated data was considered necessary.

During the mercury data validation process the reviewer noted a potential error in the preparatory and analytical sequence. Based on this potential error, it was decided that the samples in this delivery group would be re-prepared and re-analyzed 14 to 16 days outside the prescribed holding time. The results from these re-analyses were comparable to the original analyses and have been formally presented in this SDG. Table 1.1 below summarizes the qualification for hold time in mercury. The data from the original analyses were provided in the raw data section of the data package.

A volatile organic holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank have been included in the SDG and are labeled HBW008. Please note that analysis of this holding blank and its associated blank spike yielded percent recoveries of the surrogate monitoring compound 1,2-dichloroethene-d4 that slightly exceeded control criteria. No target analytes were detected in this holding blank, therefore no qualification of the associated data was considered necessary.

It was noted in the laboratory case narrative that the semivolatile organic compounds analysis of the blank spike sample S4LCS yielded a slightly elevated percent recovery (95%) of the target compound 4-Nitrophenol. The CLP method does not require the blank spike to be analyzed for the semivolatile organic compounds, however, the laboratory did report these values along with their historical QC limits of 10-80. The blank spike in this analytical set is actually at a higher accuracy than the historical QC limits; therefore no qualifications are necessary.

It was noted in the laboratory case narrative that the nitroaromatics analysis of blank spike samples D1LCS and D1LCSD yielded a slightly low percent recovery (LCS=35%, LCSD=39%) of the target

compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore they used the default criteria of 70-130. Since the LCS recovery is less than the lower limit but >10%, the associated sample result has been qualified as estimated ("UJ"/"J").

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The lack of preservative in samples SPRING39-T01N-GRW and CAPULIN1-T01N-SFW resulted in a possible loss of cyanide, therefore cyanide results for these samples are estimated "J" for positive results and "UJ" for nondetects. The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, Orthophosphate, BOD, and 28 day hold time for Mercury were not met for some samples. Table 1.1 summarizes the holding time exceedances and the resultant data qualifications. Results for hold time exceedance reflect an indeterminate bias.
Laboratory Blank Results	No	Total kjeldahl nitrogen, aluminum, boron, beryllium, copper, lead, molybdenum, and selenium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In the positive detections, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned. In the negative results with potential low bias, concentrations that produce more than 25% effect on a reported sample or sample reporting limit were qualified as estimated ("J/UJ").
Matrix QC • MS/MSD/PDS RRS-9-T01N-SFW RRS-9-D01N-SFW • LD RRS-9-T01N-SFW RRS-9-D01N-SFW	No	For matrix spike analysis on sample RRS-9-T01N-SFW, the recoveries of bicarbonate alkalinity, alkalinity, and aluminum were high, while the recoveries for hydroxide alkalinity, carbonate alkalinity and selenium were low. Table 1.3 summarizes these matrix spike results. The matrix spike results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For post digestion spike analysis on sample RRS-9-T01N-SFW, the recovery of aluminum was low. Table 1.5 summarizes these post digestion spike results and the resultant data qualifications. The post digestion spike results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment For laboratory duplicate analysis of sample RRS-9-T01N-SFW, the aluminum results did not meet acceptance criteria. Table 1.4 summarizes these results. The laboratory duplicate results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogate • Serial Dilution RRS-9-D01N-SFWL RRS-9-T01N-SFWL • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	Recoveries for internal standard Y was high for the ICPMS analysis of samples SPRING39-T01N-GRW, SPRING39-D01N-GRW, CAPULIN1-T01N-GRW, and CAPULIN1-D01N-GRW. Therefore, these samples were analyzed by Trace ICP. The serial dilution test for sample RRS-9-D01N-SFWL was applicable for 1 of the 24 metals. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. For samples RB-01T/D-SFW and CAPULIN1-T01N/D01N-GRW the absolute value of the percent difference between the anion/cation balance was –89.93 and –77.09 respectively, outside the acceptance range of ±13%. For RB-01T-SFW the orthophosphate result is 2343 times greater than the total phosphorus result. As such, the reviewer investigated the orthophosphate and the total phosphorus results to evaluate if there were any calculation or transcription errors. Therefore, the orthophosphate result for that sample was qualified as J TvP-H. The pH of sample CAPULIN1-T01N/D01N-GRW was 3.04. Evaluations of the results relative to TDS,

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		specific conductivity, and speciation of the sulfate ion at low pH indicates that the sample analyses were likely biased high. Therefore the sulfate result for that sample was qualified as J TvP-H. For RB01T-SFW, there was a significant orthophosphate detection of 32.8 mg/l reported. The results was rejected (R TvP) because the orthophosphate result was 3000x greater than the total phosphorous result of 0.014 mg/l. Additionally, the orthophosphate result for this rinsate blank is inconsistent with the TDS result of 7 mg/l.
Field QC • Field Duplicate ERLOUT-T01D-SFW ERLOUT-D01D-SFW • Rinsate Blank RB-01T-SFW RB-01D-SFW RS-14-RB01-PLTF RS-14-RB02-PLTS RS-20-RB01-PLTS RS-20-RB02-PLTF • Field Blank • Trip Blank TB11T-SED TB16T-SED TB14T-SFW • Other (e.g., splits)	No	This package included field duplicate (FD) samples that were slightly outside the control criteria as summarized in Table 1.6. Also, there were a few detections in the rinsate blanks (RB) associated with water and biota samples. These are summarized in Tables 1.7. The field quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial calibrations for VOC and SVOC analyses met all evaluation criteria. However, some VOC and SVOC continuing calibration criteria were not satisfied. Table 1.4 summarizes continuing calibration results not meeting validation criteria and the resultant data qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	BOD (mg/L)	Mercury (µg/L)
RRS-9-T01N-SFW	0.20 UJ	0.005 UJ	0.010 UJ	2.8 J	0.10 UJ
RRS-9-D01N-SFW	---	---	---	---	0.10 UJ
RB01T-SFW	0.40 UJ	0.005 UJ	32.8 J	1.4 UJ	0.10 UJ
ERLOUT-T01N-SFW	0.38 J	0.005 UJ	---	1.4 UJ	0.10 UJ
ERLOUT-D01N-SFW	---	---	---	---	0.10 UJ
ERLOUT-T01D-SFW	0.36 J	0.005 UJ	---	1.4 UJ	0.10 UJ
ERLOUT-D01D-SFW	---	---	---	---	0.10 UJ
RS-14-RB01-PLTS	---	---	---	---	0.10 UJ
RS-14-RB02-PLTF	---	---	---	---	0.10 UJ
RS-20-RB01-PLTS	---	---	---	---	0.10 UJ
RS-20-RB02-PLTF	---	---	---	---	0.10 UJ
UFLMID-T01N-SFW	---	---	---	---	0.10 UJ
UFLMID-D01N-SFW	---	---	---	---	0.10 UJ
UFLIN-T01N-SFW	---	---	---	---	0.10 UJ
UFLIN-D01N-SFW	---	---	---	---	0.10 UJ
SPRING39-T01N-GRW	---	---	---	---	0.10 UJ
SPRING39-D01N-GRW	---	---	---	---	0.10 UJ
CAPULIN1-T01N-GRW	---	---	---	---	0.10 UJ
CAPULIN1-D01N-GRW	---	---	---	---	0.10 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/L)	CCB2 (µg/L)	CCB3 (µg/L)	CCB4 (µg/L)	CCB5 (µg/L)	MB (µg/L)	IDL	Samples Qualified	Qualification Code
TKN						0.32	0.240	UFLMID-T01N-SFW, UFLIN-T01N-SFW, CAPULIN1-T01N-GRW	U MB-I
Aluminum (MS)			6.5	6.9	7.4		3.0	RB-01T-SFW, RB-01D-SFW, RS-14-RB01-PLTF, RS-20-RB01-PLTS, RS-20-RB02-PLTF	U CCB-I
Antimony (MS)	0.2						0.20	RRS-9-T01N-SFW, UFLMID-T01N-SFW	U CCB-I
Boron (P)			-7.0			-8.32	5.0	RRS-9-T01N-SFW RRS-9-D01N-SFW, RB-01T-SFW, RB-01D-SFW, ERLOUT-T01N-SFW, ERLOUT-D01N-SFW, ERLOUT-T01D-SFW, ERLOUT-D01D-SFW, RS-14-RB01-PLTF, RS-14-RB02-PLTS, RS-20-RB01-PLTS, RS-20-RB02-PLTF, UFLMID-T01N-SFW, UFLMID-D01N-SFW, UFLIN-T01N-SFW, UFLIN-D01N-SFW, SPRING39-T01N-GRW, SPRING39-D01N-GRW, CAPULIN1-T01N-GRW, CAPULIN1-D01N-GRW	UJ or J CCB-L UJ or J MB-L
Beryllium (P)						-0.307	0.30	RRS-9-T01N-SFW, RRS-9-D01N-SFW, RB-01T-SFW, RB-01D-SFW, ERLOUT-T01N-SFW, ERLOUT-D01N-SFW, ERLOUT-T01D-SFW, ERLOUT-D01D-SFW, RS-14-RB01-PLTF, RS-14-RB02-PLTS, RS-20-RB01-PLTS, RS-20-RB02-PLTF, UFLMID-T01N-SFW, UFLMID-D01N-SFW, UFLIN-T01N-SFW, UFLIN-D01N-SFW	UJ or J MB-L
Manganese (P)						1.247	0.7	RRS-9-T01N-SFW, RRS-9-D01N-SFW, RB-01T-SFW,	U MB-I
Nickel (MS)			0.4	0.3	0.4		0.20	RS-14-RB02-PLTS, RS-20-RB02-PLTF	U CCB-I

Analyte	CCB1 (µg/L)	CCB2 (µg/L)	CCB3 (µg/L)	CCB4 (µg/L)	CCB5 (µg/L)	MB (µg/L)	IDL	Samples Qualified	Qualification Code
Selenium (MS)			-0.4	0.2	0.4		0.20	RRS-9-T01N-SFW, RRS-9-D01N-SFW, RB-01T-SFW, RB-01D-SFW, ERLOUT-T01N-SFW, ERLOUT-D01N-SFW, ERLOUT-T01D-SFW, ERLOUT-D01D-SFW, RS-14-RB01-PLTF, RS-14-RB02-PLTS, RS-20-RB01-PLTS, UFLMID-T01N-SFW, UFLMID-D01N-SFW, UFLIN-T01N-SFW, UFLIN-D01N-SFW	UJ or J CCB-L
Zinc (P)	-4.8	-4.8	-5.0	-4.7	-4.4		2.1	RRS-9-T01N-SFW, RRS-9-D01N-SFW, RB-01T-SFW, RB-01D-SFW, RS-14-RB01-PLTF, RS-14-RB02-PLTS, RS-20-RB02-PLTF, UFLMID-T01N-SFW, UFLMID-D01N-SFW, UFLIN-T01N-SFW, UFLIN-D01N-SFW	UJ or J CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike, Matrix Spike Duplicate, and Post Digestion Spike Recovery Not Meeting Criteria

Sample/Analytes	Matrix Spike Recovery	Matrix Spike Duplicate Recovery	Post digestion Spike Recovery	Acceptance Limits	Action
RRS-9-T01N-SFW					
Hydroxide Alkalinity	2.0%	NA	NA	75-125%	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery. No qualification was necessary.
Carbonate Alkalinity	2.0%	NA	NA		
Bicarbonate Alkalinity	130.4%	NA	NA		
Total Alkalinity	130.4%	NA	NA		
Aluminum	128.0%	NA	69.7%		Qualify parent sample UJ MS, PDS-I
Selenium	70.6%	NA	NA		Qualify parent sample UJ MS-L

NA = Not appropriate

Table 1.4
Duplicate Qualifications

Sample/Analyte	Absolute Difference	1xPQL	Action
RRS-9-T01N-SFW • Aluminum	46.4	40	The laboratory duplicate results for water and biota for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Table 1.5
Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	ERLOUT-T01N-GRW	ERLOUT-T01D-GRW	Criteria Comment	Outside Criteria	RL	Action
Orthophosphate (mg/l)	0.366	0.01	Abs. Diff. <2xRL (0.02)	Abs Diff.=0.356	0.01	UJ/J FD-L parent

Table 1.6
Rinsate Blanks

Analyte	RB-01T-SFW (µg/l)	RB-01D-SFW (µg/l)	RS-14-RB01-PLTF (µg/l)	RS-14-RB02-PLTS (µg/l)	RS-20-RB01-PLTS (µg/l)	RS-20-RB02-PLTF (µg/l)
TDS	7.0	---	---	---	---	---
TSS	1.6	---	---	---	---	---
Bicarbonate Alkalinity	1.2	---	---	---	---	---
Alkalinity	1.2	---	---	---	---	---
Ammonia	0.042	---	---	---	---	---
Phosphorus	0.014	---	---	---	---	---
Copper	---	---	---	0.53	0.47	---
Lead	---	0.21	---	---	---	---
Manganese	---	---	---	---	---	1.0
Zinc	9.2	---	13.4	---	22.1	8.7

Table 1.78
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
10/14/02 (0852)	Acetone 2-Butanone 2-Hexanone	49.0% 37.6% 35.8%	TB11T-SED, TB16T-SED, UFLMID-T01N-SFW, TB14T-SFW	UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
10/15/02 (0755)	Benzaldehyde 4-Nitroaniline 3,3'-Dichlorobenzidine Di-n-octylphthalate	47.0% 32.4% 27.6% -31.4%	UFLMID-T01N-SFW	UJ CCAL-I

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT009 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 11/30/02

Peer Reviewer: Stacey Coker Date Completed: 12/15/02

The table below summarizes the results presented in this data package.

Field ID	Lab ID	QC Type[1]	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RB01T-SOL	504767	RB		W	X	X					
UFLOUT-T01N-SFW	504768	SA		W	X	X					
UFLOUT-D01N-SFW	504769	SA		W	X						
SW12-2-T01N-SFW	504770	SA		W	X	X					
SW12-2-D01N-SFW	504771	SA		W	X						
TB14T-SED	504772	TB		W			X				
SPRING9-T01N-GRW	504773	SA		W	X	X					
SPRING9-D01N-GRW	504774	SA		W	X						
SPRING10-T01N-GRW	504775	SA		W	X	X					
SPRING10-D01N-GRW	504776	SA		W	X						
SW12-3-T01N-SFW	504777	SA		W	X	X					
SW12-3-D01N-SFW	504778	SA		W	X						
SW12-1-T01N-SFW	504779	SA		W	X	X					
SW12-1-D01N-SFW	504780	SA		W	X						
ND-1-T01N-SFW	504900	SA		W	X	X					
ND-1-D01N-SFW	504901	SA		W	X						
RB-01T-SFW	504902	RB		W	X	X					
RB-01D-SFW	504903	RB		W	X						
CD-1-T01N-SFW	504904	SA		W	X	X					
CD-1-D01N-SFW	504905	SA		W	X						

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank

[1] The matrix code at the end of the filed ID indicates the sample matrix that the QC sample is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

This package included the ion chromatography (IC) initial calibration data for 10/02/02 and 10/13/02. The initial calibration curve from 10/02/02 was used to calculate the reported sample results. The 10/13/02 curve included in the package was considered invalid and was not saved by the laboratory data system. The 10/13/02 curve included in the package should be disregarded.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3, rather than Nitrate as N. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. Thus, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. However, the error was not discovered until after the results for WAT packages 001 through 009 were reported. The laboratory issued replacement data sheets for data packages WAT001 through WAT009, which were collated into the original data sets. The original nitrate data sheets for the affected packages were marked as superseded. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

During the alkalinity analysis of the samples in this sample delivery group (SDG), the associated blank sample yielded an alkalinity concentration that was marginally above the laboratory reporting limit (RL). However, the concentration was less than the reporting limit listed in the QAPP, and therefore results from this analysis were reported.

Additionally, some ICP/MS laboratory control sample (LCS) recoveries were high as summarized in Table 1.4.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The BOD/COD analysis for samples UFLOUT-T01N-SFW, SW12-2-T01N-SFW, SW12-3-T01N-SFW, and SW12-1-T01N-SFW were not requested on the COC, however, bottles were sent for analysis. The laboratory analyzed these four samples per the clarification fax sent to the laboratory.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, Orthophosphate, and BOD were not met. See Table 1.1 for sample qualifications. The bias direction for results qualified on the basis of holding times are considered to be an indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, boron, copper, molybdenum, nickel, and selenium were detected in various blanks. Table 1.2 summarizes the blank detentions and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control (QC) samples. The MS results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution RB01T-SOL • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution test was not applicable for the 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL (adjusted for dilution). It was therefore not necessary to qualify any results in this sample on the basis of serial dilutions. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. The TDS result for sample RB01T-SFW was rejected because the measured TDS (190 mg/L) did not agree with the calculated TDS (4 mg/L based mostly on detection limits). The ratio between the two results was 0.02, which is outside the acceptance range of 0.50 to 1.50. The copper results for samples SW12-3-D01N-SFW and SW12-3-T01N-SFW were qualified as estimated (J/UJ TvP-I) because the dissolved copper results were greater than the total copper results.
Field QC • Field Duplicate • Rinsate Blank RB-01T-SFW RB-01D-SFW RB01T-SOL • Field Blank • Trip Blank TB14T-SED • Other (e.g., splits)	No	There were some detections in all of the rinsate blanks (RB) for surface water and solids. These are summarized in Table 1.3. The RB for surface water and solids for the Fall 2002 event will evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial calibration for VOC analysis met all evaluation criteria. However, some of the VOC continuing calibration criteria were not satisfied. Table 1.5 summarizes the continuing calibration results not meeting validation criteria and the resultant data qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	BOD (mg/L)
RB01T-SOL	0.20 UJ	---	---	---
UFLOUT-T01N-SFW	0.20UJ	0.005 UJ	0.10 UJ	5.4 J
SW12-2-T01N-SFW	3.6 J	0.35 J	0.10 UJ	1.4 UJ
SPRING9-T01N-GRW	4.8 J	0.005 UJ	0.049 J	---
SPRING10-T01N-GRW	1.8 J	0.005 UJ	0.018 J	---
SW12-3-T01N-SFW	0.20 UJ	0.005 UJ	0.010 UJ	1.9 J
SW12-1-T01N-SFW	3.5 J	0.030 J	0.010 UJ	1.4 UJ
ND-1-T01N-SFW	1.6 J	0.005 UJ	0.010 UJ	1.5 UJ
RB-01T-SFW	0.20 UJ	0.005 UJ	0.010 UJ	1.5 UJ
CD-1-T01N-SFW	1.6 J	0.005 UJ	0.010 UJ	1.5 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	CCB7 (µg/l)	IDL	Samples Qualified	Qualification Codes
Aluminum (MS)		6.5	6.9	7.4	7.2	7.6	3.0	RB-01T-SFW, RB01T-SOL, SPRING9-D01N-GRW, SPRING10-D01N-GRW, SPRING10-T01N-GRW, SW12-1-D01N-SFW, SW12-3-D01N-SFW	U CCB-I
Antimony (MS)	0.2						0.20	RB01T-SOL, SW12-1-D01N-SFW, SW12-1-T01N-SFW, SW12-2-D01N-SFW, SW12-2-T01N-SFW, SW12-3-D01N-SFW	U CCB-I
Boron (P)	5.2						4.8	CD-1-D01N-SFW, CD-1-T01N-SFW, ND-1-D01N-SFW, ND-1-T01N-SFW, SW12-1-D01N-SFW, SW12-1-T01N-SFW, SW12-2-D01N-SFW, SW12-2-T01N-SFW, SW12-3-D01N-SFW, SW12-3-T01N-SFW, UFLOUT-D01N-SFW, UFLOUT-T01N-SFW	U CCB-I
Copper (MS)					0.3	0.4	0.30	RB-01D-SFW, SPRING10-D01N-GRW, SPRING10-T01N-GRW, SPRING9-D01N-GRW, SPRING9-T01N-GRW, SW12-1-D01N-SFW, SW12-2-D01N-SFW, SW12-2-T01N-SFW	U CCB-I
Nickel (MS)		0.4	0.4	0.3	0.4	0.4	0.20	RB01T-SOL, SPRING10-D01N-GRW, SPRING10-T01N-GRW, SPRING9-D01N-GRW, SPRING9-T01N-GRW	U CCB-I

Analyte	CCB1 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	CCB7 (µg/l)	IDL	Samples Qualified	Qualification Codes
Selenium (MS)			0.2	0.4	0.2	0.6	0.20	CD-1-D01N-SFW, CD-1-T01N-SFW, ND-1-D01N-SFW, ND-1-T01N-SFW, RB-01T-SFW, RB-01D-SFW, RB01T-SOL, SPRING10-D01N-GRW, SPRING10-T01N-GRW, SPRING9-D01N-GRW, SPRING9-T01N-GRW, SW12-1-D01N-SFW, SW12-1-T01N-SFW, SW12-2-D01N-SFW, SW12-2-T01N-SFW, SW12-3-D01N-SFW, SW12-3-T01N-SFW, UFLOUT-D01N-SFW, UFLOUT-T01N-SFW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

[1] Compound is a tentatively identified compound (TIC). TICs in method blanks are not considered to be reportable as TICs for samples.

[2] Compound is a suspected aldol condensation product of acetone.

Table 1.3
Positive Results for Rinsate Blanks

Analyte	RB-01T-SFW (µg/l)	RB-01D-SFW (µg/l)	RB01T-SOL (µg/l)	RL
Aluminum (MS)	U	49.2	U	3.0
Iron (P)	28.3	U	83.1	22.6
Lead (MS)	0.11	U	0.29	0.10
Manganese (P)	3.3	U	U	2.5

P = ICP MS = ICP-MS

RL = Reporting Limit. The laboratory used the instrument detection limit (IDL) as the RL.

Table 1.4
ICP/MS Laboratory Control Sample Results and Qualification

Analyte	LCS Recovery	LCSD Recovery	Ave %R	Acceptance Range	Qualification
Aluminum	138.3 %	122.1 %	130.2 %	75-125%	J LCS – H for all positive results
Antimony	126.5 %	112.9 %	118.7 %		None
Copper	138.3 %	124.7 %	131.5 %		J LCS – H for all positive results
Lead	130.1 %	116.5 %	123.3 %		None
Nickel	138.1 %	124.8 %	131.4 %		J LCS – H for all positive results
Molybdenum	131.0 %	116.0 %	123.5 %		None
Thallium	128.7 %	115.0 %	121.8 %		None
Vanadium	133.5 %	118.4 %	125.9 %		J LCS – H for all positive results

Table 1.5
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
10/14/02 (0852)	Acetone 2-Butanone 2-Hexanone	49.0% 37.6% 35.8%	TB14T-SED	UJ CCAL-I

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT010 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 12/15/02

Peer Reviewer: Alan Roberts Date Completed: 1/20/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Pesticides	Explosives	PCBs
LOWERSPG13-T01N-GRW	SA	504940	LOWER SPG	W	X	X					
LOWERSPG13-D01N-GRW	SA	504941	LOWER SPG	W	X						
RRS-29-RB01-PLTF 10/9	RB	504942		W	X						
RRS-29-RB02-PLTG 10/9	RB	504943		W	X						
RB01T-SOL 10/10	RB	505113	RB01TSOL1010	W				X		X	
TB15-SOL	TB	505114		W			X				
TB32T-SOL	TB	505432		W			X				
FB01T-SOL 10/13	FB	505433	FB01TSOL1013	W			X	X	X		
TB27T-SOL	TB	505434		W			X				
RB01T-SOL 10/13	RB	505435	RB01TSOL1013	W	X	X	X	X			
MSS3-2-RB01-PLTG 10/11	RB	505436		W	X						
MSS3-2-RB02-PLTS 10/11	RB	505437		W	X	X					
RB01T-SOL 10/14	RB	505566	RB01TSOL1014	W	X	X	X	X	X		
RB02T-SOL 10/14	RB	505567		W	X						
RB03T-SOL 10/14	RB	505568		W	X		X	X	X		
TB40T-SOL	TB	505569		W		X	X				
TB23T-SOL	TB	505570		W			X				
TB34T-SOL	TB	505571		W			X				
FB01T-SOL 10/14	FB	505572	FB01TSOL1014	W		X	X	X	X		
TB17T-SOL	TB	505573		W			X				

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC sample is associated with.

[2] Due to limitations of the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, they are identified under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

This package did not initially include the ion chromatography (IC) initial calibration from 10/02/02, which was used to calculate the reported sample results. A copy of this curve was provided by the laboratory at a later date and incorporated into the data package. The 10/13/02 curve included in the package was considered invalid and was not saved by the laboratory data system. The 10/13/02 curve included in the package should be disregarded.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. After the error was discovered, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

The case narrative indicates that during the alkalinity analysis of the samples in this SDG, the associated blank samples yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the blank sample result was reported as nondetect at a RL of 1mg/L from this analysis. No qualification of the associated data was considered necessary.

A volatile organic holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank have been included in the SDG and are labeled HBW010. Please note that analysis of this holding blank and its associated blank spike yielded percent recoveries of the surrogate monitoring compound 1,2-dichloroethene-d4 that slightly exceeded control criteria. No target analytes were detected in this holding blank, therefore no qualification in the associated data was considered necessary.

It was noted in the laboratories case narrative that the semivolatile organic compounds analysis of the blank spike sample S4LCS yielded a slightly elevated percent recovery (99%) of the target compound 4-Nitrophenol. The CLP method does not require the blank spike to be analyzed for the semivolatile organic compounds, however, the laboratory did report these values along with their historical QC limits of 10-80. The blank spike in this analytical set is actually at a higher accuracy than the historical QC limits; therefore no qualifications are necessary.

During the pesticides analysis of the samples in this delivery group, the resolution between the target compounds 4,4'DDE and endosulfan was below the control criteria. However, these compounds were not detected in any of the associated samples, and therefore no further action was taken.

It was noted in the laboratory case narrative that the nitroaromatics analysis of blank spike samples D1LCS and D1LCSD yielded a slightly lower percent recovery (LCS=35%, LCSD=52%) of the target compound PYX. The laboratory has not yet established control limits for this compound, therefore they used the default criteria of 70-130. Since the LCS recovery is less than the lower limit but >10%, the associated sample results have been qualified as estimated ("UJ"/"J").

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There was one problem noted with sample receipt. Sample RB03T-SOL has the collection time accidentally written on the COC as 16:42. The container, on the other hand, has the correct collection time of 16:47. The laboratory was contacted and the correction was made so that the sample reflected the correct collection time. The laboratory indicated a lack of adequate preservative in sample LOWERSPG13-T01N-GRW which resulted in a possible degradation of cyanide, therefore this sample was qualified as estimated "UJ". The laboratory did add additional NaOH and ascorbic acid to this sample to adjust the pH.
Holding Times	No	The 48-hour hold times for Nitrate as N, and Nitrite as N were not met. Table 1.1 summarizes the holding time exceedances and the resultant for some sample data qualifications. Results for hold time reflect an indeterminate bias.
Laboratory Blank Results	No	Aluminum, boron, beryllium, copper, lead, molybdenum, selenium, 1,1,2,2-tetrachloroethane, 1,2,4-trichlorobenzene and xylene were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned. In the negative blank results with potential low bias, concentrations that produce more than 25% effect on a reported sample or sample reporting limit have been qualified as estimated ("J/UJ").
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control (QC) samples. The MS results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RB01T-SOL 10/14 • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution test was not applicable for the 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL (adjusted for dilution). It was therefore not necessary to qualify any results in this sample on the basis of serial dilutions. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. Recoveries for internal standard Y was high for the ICPMS analysis of samples LOWERSPG13-T01N-GRW and LOWERSPG13-D01N-GRW. However, these samples were diluted and reanalyzed. All molybdenum results were reported from analyses with passing internal standards. For sample LOWERSPG13-T01N/D01N-GRW the absolute value of the percent difference between the anion/cation balance was –-17.80 outside the acceptance range of ±13%. The pH of sample LOWERSPG13-T01N/D01N-GRW was 3.62. Evaluations of the results relative to TDS, specific conductivity, and speciation of the sulfate ion at low pH indicates that the sample analyses were likely biased high. Therefore the sulfate result for that sample was qualified as J TvP-H.
Field QC • Field Duplicate • Rinsate Blank RRS-29-RB01-PLTF RRS-29-RB02-PLTG RB01T-SOL 10/10 MSS3-2-RB01-PLTG MSS3-2-RB02-PLTS RB01T-SOL 10/13 RB01T-SOL 10/14 RB02T-SOL 10/14 RB03T-SOL 10/14 • Field Blank FB01T-SOL 10/13 FB01T-SOL 10/14	No	There were a few detections in the various field quality control blanks (RB and FB). These are summarized in Tables 1.3a, 1.3b, 1.3c and 1.4. The RB results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
• Trip Blank TB15T-SOL TB32T-SOL TB27T-SOL TB40T-SOL TB23T-SOL TB34T-SOL TB17T-SOL • Other (e.g., splits)		
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. Table 1.5 summarizes continuing calibration detections and the resultant data qualifications • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/l)	Nitrite as N (mg/l)
LOWERSPRING13-T01N-GRW	1.0 UJ	0.005 UJ
RB01T-SOL 10/13	0.40 UJ	---

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Boron (P)	14.0	11.8	12.4	10.9	14.4	8.004	5.0	LOWERSPG13-T01N-GRW, LOWERSPG13-D01N-GRW, RB01T-SOL 10/13, MSS3-2-RB01T-PLTG, MSS3-2-RB02-PLTS, RB01T-SOL 10/14, RB03T-SOL 10/14	U CCB-I U MB-I
Beryllium (P)	---	---	---	-0.5	-0.5	-0.3348	0.30	RRS-29-RB01-PLTF, RRS-29-RB02-PLTG, RB01T-SOL 10/13, MSS3-2-RB01-PLTG, MSS3-2-RB02-PLTS, RB01T-SOL 10/14, RB02T-SOL 10/14, RB03T-SOL 10/14	U CCB-I U MB-I
Copper (MS)	---	---	---	---	---	-0.869	0.30	RRS-29-RB01-PLTF, RRS-29-RB02-PLTG, RB01T-SOL 10/13, MSS3-2-RB01-PLTG, MSS3-2-RB02-PLTS, RB01T-SOL 10/14, RB02T-SOL 10/14, RB03T-SOL 10/14	J or UJ MB-L
Lead (MS)	---	---	---	---	---	-0.121	0.10	LOWERSPG13-T01N-GRW, LOWERSPG13-D01N-GRW, RRS-29-RB01-PLTF, RRS-29-RB02-PLTG, RB01T-SOL 10/13, MSS3-2-RB01-PLTG, MSS3-2-RB02-PLTS, RB01T-SOL 10/14, RB02T-SOL 10/14, RB03T-SOL 10/14	J or UJ MB-L
Molybdenum (MS)	0.5	---	---	---	---	---	0.20	RB01T-SOL 10/13, RB01T-SOL 10/14, RB03T-SOL 10/14	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank MB=Method Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3a
Positive Wet Chemistry Results for Rinsate Blanks

Analyte	RB01T-SOL 10/13	RB01T-SOL 10/14	RB02T-SOL 10/14	RB03T-SOL 10/14
Ammonia (mg/L)	---	0.078	0.057	0.082
Fluoride (mg/L)	0.11	---	---	---
Phosphorus (mg/L)	0.020	---	---	0.066
Chloride (mg/L)	NA	---	---	0.45
Sulfate (mg/L)	---	---	---	1.4

RL = Reporting Limit

Table 1.3b
Positive Metal Results for Rinsate Blanks

Analyte	RB01T-SOL-10/13	RB01T-SOL-10/14	RB03T-SOL-10/14	RRS-29-RB01-PLTF	RRS-29-RB02-PLTG	MMS3-2-RB01-PLTG	MMS3-2-RB02-PLTS
Aluminum (µg/l)	13.8	---	54.1	7.1	4.7	60.6	14.0
Antimony (µg/l)	---	---	0.25	---	---	---	---
Boron (µg/l)	7.4	9.6	6.1	---	---	7.3	5.6
Iron (µg/l)	---	---	56.1	---	---	---	---
Lead (µg/l)	0.18	---	0.14	---	---	---	---
Manganese (µg/l)	2.5	0.70	2.6	1.2	0.82	2.5	1.3
Molybdenum (µg/l)	0.82	0.23	1.3	---	---	---	---
Nickel (µg/l)	---	---	---	1.6	---	0.57	---
Potassium (µg/l)	---	---	---	---	---	231.0	---
Selenium (µg/l)	---	---	---	---	---	---	---
Vanadium (µg/l)	---	---	---	---	---	0.15	---
Zinc (µg/l)	3.7	3.3	3.8	16.0	14.2	26.8	13.0

RL = Reporting Limit

For the metals analysis, the laboratory used use the instrument detection limit (IDL) as the RL.

Table 1.3c
Positive VOC Results for Rinsate Blanks

Analyte	RB01T-SOL 10/13	RB01T-SOL 10/14	RB03T-SOL 10/14
Carbon Disulfide (µg/l)	3	6	2
Chloroform (µg/l)	4	3	3

RL = Reporting Limit

Table 1.4
Positive Results for Field Blanks

Analyte	FB01T-SOL 10/13	FB01T-SOL 10/14
Methylene Chloride (µg/l)	1	---
Chloroform (µg/l)	4	4

RL = Reporting Limit

Table 1.5
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
10/14/02 (0852)	Acetone 2-Butanone 2-Hexanone	49.0% 37.6% 35.8%	TB15-SOL	UJ CCAL-I
10/20/02 (1204)	Acetone 2-Butanone 2-Hexanone	64.3% 49.7% 41.6%	TB40T-SOL	UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
10/15/02 (0755)	Benzaldehyde 4-Nitroaniline 3,3'-Dichlorobenzidine Di-n-octylphthalate	47.0% 32.4% 27.6% -31.4%	RB01T-SOL 1010	UJ CCAL-I
10/23/02 (0337)	Benzaldehyde 3,3'-Dichlorobenzidine Di-n-octylphthalate Benzo (b) fluorantthene	31.4% 25.7% -33.9% -25.2%	FB01T-SOL 1013, RB01T-SOL 1013, RB03T-SOL	UJ CCAL-I
10/23/02 (0337)	2-Chloronaphthalene 1,1'-Biphenyl 2,4-Dinitrophenol 3,3'-Dichlorobenzidine Di-n-octylphthalate	33.6% 33.0% 26.3% 27.2% -30.4%	RB01T-SOL 1014, FB01T-SOL 1014	UJ CCAL-I

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT011 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 2/4/03

Peer Reviewer: Stacey Coker Date Completed: 8/3/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
TB39T-SOL	TB	505796		W			X				
RB01T-SOL 10/15	RB	505797	RB01T-SOL1015	W	X	X					
TB20T-SOL	TB	505798		W			X				
RB03T-SOL 10/15	RB	505799	RB03TSOL1015	W	X	X	X	X			
FB01T-SOL	FB	505800		W			X	X	X		
RB02T-SOL 10/15	RB	505801	RB02T-SOL1015	W	X	X					
RB02T-SOL 10/16	RB	505974	RB02T-SOL1016	W	X	X					
RB03T-SOL 10/16	RB	505795	RB03TSOL1016 or RB03T-S0L1016	W	X	X	X	X[3]			X
RB01T-SOL 10/16	RB	505976		W				X[3]			X
TB37T-SOL	TB	505977		W			X				
TB36T-SOL	TB	505978		W			X				
TB38T-SOL	TB	505979		W			X				
RB01T-SOL 10/18	RB	506351	RB01T-SOL1018	W	X	X					
RB02T-SOL 10/18	RB	506352	RB02T-SOL1018	W	X	X					
RB03T-SOL 10/18	RB	506353	RB03T-SOL1018	W	X	X					
RB04T-SOL 10/18	RB	506354	RB04T-SOL1018	W	X	X					
RB05T-SOL 10/18	RB	506355	RB05T-SOL1018	W	X	X					
RB06T-SOL 10/18	RB	506356	RB06T-SOL1018	W	X	X					

Matrix: W = Water

QC Type: TB = Trip Blank RB = Rinsate Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

[3] Sample lost due to technical problems.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

This package did not initially include the ion chromatography (IC) initial calibration from 10/02/02, which was used to calculate the reported sample results. A copy of this curve was provided by the laboratory at a later date and incorporated into the data package. The 10/13/02 curve included in the package was considered invalid and was not saved by the laboratory data system. The 10/13/02 curve included in the package should be disregarded.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. After the error was discovered, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

During the ammonia analysis performed on 11/12/02, the blank spike duplicate analysis was compromised, resulting in no blank spike duplicate being reported for this batch. No qualification of the associated data was considered necessary.

The semivolatile organic compounds (SVOCs) analysis in samples RB03T-SOL 10/16 and RB01T-SOL 10/16 was unsuccessful due to an equipment failure. The sample extracts were completely lost and therefore the process could not continue. The laboratory had insufficient volumes remaining to reanalyze these two samples for SVOCs.

The pesticide analysis of laboratory control sample yielded a slightly low percent recovery of the target compound Endrin (LCS= 140%, LCSD=150%) and 4,4'-DDT (LCS= 140%, LCSD=150%) The samples in this SDG were only analyzed for PCBs only, therefore no qualification of the associated data was considered necessary.

The nitroaromatics analysis of laboratory control sample yielded a slightly low percent recovery (LCS=52%, LCSD=52%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were problems noted with sample receipt. Sample RB02T-SOL with a sampling time of 1720 was accidentally marked on the COC as RB01T-SOL with a sampling time of 1728. The laboratory was contacted and the correction was made so that this sample was logged in for the correct sample name and sampling time.
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Beryllium, boron, selenium, zinc, 1,2-Dibromo-3-chloropropane, 1,2,4-trichlorobenzene, 1,1,2-Trichloro-1,2,2-trifluoethane, xylene, 1,1,2,2-tetrachloroethane, and acetone were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned to positive blank results and a low bias was assigned to all negative blank values.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD/PDS • LD	Yes	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RB01T-SOL 10/15 Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery for the volatile organic compound analysis was high in both the original and reanalysis of sample TB37T-SOL. The recovery of Toluene-d3 was 119%. This recovery is outside the acceptance range of 88%-110%, suggesting a potential high bias in the associated sample results. Also, the recovery of 1,2-dichloroethane was 124%. This recovery is outside the acceptance range of 76%-114%, suggesting a potential high bias in the associated sample results. Because the surrogate recovery is higher than the acceptance limit, and all of the associated date results are nondetect, no qualification was considered necessary. The serial dilution test was not applicable for the 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL (adjusted for dilution). It was therefore not necessary to qualify any results in this sample on the basis of serial dilutions. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment.
Field QC • Field Duplicate • Rinsate Blank RB01T-SOL 10/15 RB02T-SOL 10/15 RB03T-SOL 10/15 RB01T-SOL 10/16 RB02T-SOL 10/16 RB03T-SOL 10/16 RB01T-SOL 10/18 RB02T-SOL 10/18 RB03T-SOL 10/18 RB04T-SOL 10/18 RB05T-SOL 10/18 RB06T-SOL 10/18 • Field Blank FB01T-SOL 10/15 • Trip Blank TB20T-SOL TB36T-SOL TB37T-SOL TB38T-SOL TB39T-SOL • Other (e.g., splits)	Yes	There were a few detections in the various field quality control blanks (RBs and FB). These are summarized in Tables 1.3a, 1.3b, 1.3c, and 1.4. The RB and FB results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The LCS results for explosives and pesticides were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial and continuing calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N
RB01T-SOL 10/18	0.40 UJ
RB02T-SOL 10/18	0.40 UJ
RB03T-SOL 10/18	0.40 UJ
RB04T-SOL 10/18	0.40 UJ
RB05T-SOL 10/18	0.40 UJ
RB06T SOL 10/18	0.40 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P)	-0.4	-0.5	-0.5	-0.5	-0.496	0.30	RB01T-SOL 10/15, RB01T-SOL 10/18, RB02T-SOL 10/15, RB02T-SOL 10/16 RB02T-SOL 10/18, RB03T-SOL 10/15, RB03T-SOL 10/16, RB03T-SOL 10/18, RB04T-SOL 10/18, RB05T-SOL 10/18, RB06T-SOL 10/18	UJ CCB,MB-L

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Boron (P)	11.8	12.4	10.9	14.4	9.368	5.0	RB01T-SOL 10/15, RB01T-SOL 10/18, RB02T-SOL 10/15, RB02T-SOL 10/16 RB02T-SOL 10/18, RB03T-SOL 10/15, RB03T-SOL 10/16, RB05T-SOL 10/18, RB06T-SOL 10/18	U CCB,MB-I
Zinc (P)	---	---	---	---	2.168	2.1	RB01T-SOL 10/18, RB03T-SOL 10/18	U MB-I
Analyte					**MB (µg/l)**	**RL**	**Samples Qualified**	**Qualification Code**
4-Hydroxy-4-Methyl 2 Pentanone[1, 2]					9	10	FB01T-SOL 10/17, RB03T-SOL 1017	Reject identification of TIC
UNKOWN[1]					8	10	FB01T-SOL 10/17	Reject identification of TIC

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

[1] TICs in method blanks are not considered to be reportable as TICs for samples.

[2] Compound is a suspected aldol condensation product of acetone

Table 1.3a
Positive Inorganic Results for Rinsate Blanks

Sample ID	Ammonia	Phosphorus	TOC	Sulfate
RB02T-SOL 10/15	0.43			
RB03T-SOL 10/15	0.071			
RB02T-SOL 10/16	0.041			
RB03T-SOL 10/16	0.081			
RB01T-SOL 10/18	0.047	0.022		
RB02T-SOL 10/18	0.071	0.021		
RB03T-SOL 10/18	0.059	0.022		
RB04T-SOL 10/18	0.066	0.020		
RB05T-SOL 10/18	0.075	0.10	1.0	
RB06T-SOL 10/18	0.073	0.052		2.0

All results reported in µg/l.

Table 1.3b
Positive Metals Results for Rinsate Blanks

Sample (µg/l)	Al	Ba	Ca	Cr	Cu	Fe	K	Mn	Mo	Na	Ni	Pb	V	Zn
RB01T-SOL 10/15									0.21					
RB02T-SOL 10/15	5.2				1.5			1.3	0.89					
RB03T-SOL 10/15	67.2					56.5		2.2	0.33			0.12	0.14	

Sample (µg/l)	Al	Ba	Ca	Cr	Cu	Fe	K	Mn	Mo	Na	Ni	Pb	V	Zn
RB02T-SOL 10/16	4.5			2.0				1.0						18.6
RB03T-SOL 10/16	46.1					44.8		2.0	0.51	695			0.16	
RB01T-SOL 10/18	15.6							1.3	0.57					
RB03T-SOL 10/18	16.8							2.5						
RB04T-SOL 10/18	6.0							1.6						
RB05T-SOL 10/18	721	11	175	2.2	3.3	543	191	63	0.47		2.4	1.8	0.83	32.6
RB06T-SOL 10/18	469	7.2			0.83	422		29.7	0.36		0.88	1.2	0.63	15.4

Table 1.3c
Positive VOCs Results for Rinsate Blanks

Sample (µg/l)	Carbon Disulfide	Chloroform
RB03T-SOL 10/15	4	5
RB03T-SOL 10/16		4

Table 1.4
Positive VOCs Results for Field Blanks

Sample (µg/l)	Chloroform
FB01T-SOL	5

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT012 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 2/18/03

Peer Reviewer: Stacey Coker Date Completed: 8/03/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RB02T-SOL	RB	506153	R02T-SOL1017	W	X	X	X	X	X		X
FB01T-SOL	FB	506154		W				X			X
RB01T-SOL	RB	506155	RB01T-SOL1017, RB01TSOL1017	W	X	X		X			X
TB56T-SOL	TB	506156		W			X				
TB53T-SOL	TB	506157		W			X				
TB48T-SOL	TB	506158		W			X				
FB02T-SOL	FB	506159		W			X				
TB33T-SOL	TB	506160		W			X				
TB55T-SOL	TB	506161		W			X				
RB01T-SOL	RB	506162		W			X				
TB50T-SOL	TB	506163		W			X				
TB49T-SOL	TB	506164		W			X				
RB01T-SOL	RB	506641	RB01T-SOL1021, RB01TSOL1021	W	X	X	X	X			X
TB57-SOL	TB	506642		W			X				
TB46-SOL	TB	506643		W			X				
TB47T-SOL	TB	506644		W			X				
TB45-SOL	TB	506645		W			X				

Matrix: W = Water

QC Type: TB = Trip Blank RB = Rinsate Blank FB = Field Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

This package did not initially include the ion chromatography (IC) initial calibration from 10/02/02, which was used to calculate the reported sample results. A copy of this curve was provided by the laboratory at a later date and incorporated into the data package. The 10/13/02 curve included in the package was considered invalid and was not saved by the laboratory data system. The 10/13/02 curve included in the package should be disregarded.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. After the error was discovered, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

The ICP/MS analysis of blank spike sample LCSW1027C in selenium yielded a slightly low percent recovery (LCS=73.8%) out of the acceptance limits of 75-125. Because the LCS recovery is less than the lower limit but ≥30%, the selenium results for all samples have been qualified as estimated (UJ/J).

The semivolatile organic compound analysis of laboratory control sample yielded a slightly high percent recovery (LCS=83%, LCSD=91%) of the target compound 4-nitrophenol and (LCSD=112%) of the target compound pentachlorophenol. Because the recoveries are greater than the acceptance limits (4-nitrophenol = 10%-88%, pentachlorophenol = 9%-103%) and all of the sample results are nondetect, the LCS and LCSD results are considered acceptable and all sample results are considered acceptable for use without qualification.

The nitroaromatics analysis of laboratory control sample yielded a slightly low percent recovery (LCS=52%, LCSD=52%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

The pesticide analysis of laboratory control sample yielded a slightly high percent recovery of the target compounds gamma-BHC (U5LCS=130%), Aldrin (V7LCS=124%), Dieldrin (V7LCS=130%, V7LCSD=130%), Endrin (U5LCS=140%, USLCSD=130%, V7LCS=150%, V7LCSD=140%), and 4,4'-DDT (U5LCS=130%, V7LSC=140%, V7LCSD=130%). Because the recoveries are greater than the acceptance limits (gamma-BHC = 56%-123%; Aldrin 40%-120%; Dieldrin 52%-126%; Endrin = 56%-121%; and 4,4'-DDT = 38%-127%) and all of the sample results are nondetect, the LCS and LCSD results for are considered to be acceptable. In addition, all sample results are considered acceptable for use without qualification.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blank Results	No	Aluminum, boron, iron, molybdenum, selenium, xylene, 1,1,2,2-tetrachloroethane, 1,2,4-trichlorobenzene, and 1,2-dibromo-3-chloropropane were detected in various blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned to positive blank results and a low bias was assigned to all negative blank values.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RB01T-SOL 10/15 • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery for the volatile organic compounds analysis was high in samples TB56T-SOL, TB53T-SOL, TB49T-SOL, TB56T-SOLRE, and RB01T-SOL. The recoveries of 1,2-dichloroethane-d4 were 130%, 120%, 121%, 116%, and 120%, respectively. These recoveries were outside the acceptance range of 76%-114%, suggesting a potential high bias in the associated sample results. Because the surrogate recoveries are greater than the upper limit and all of the sample results are nondetect, the results for all samples will be acceptable for use without qualification. The surrogate recovery for the semivolatile organic compounds analysis was high in samples FB01T-SOL (2-fluorophenol=124%; phenol-d5=122%; 2-chlorophenol-d4=127%; and 2-fluorobiphenyl=132%), RB02T-SOL (2-fluorophenol=118%), and RB01T-SOL 10/17 (2-fluorophenol=125%). These recoveries were outside the acceptance range (2-fluorophenol=21%-110%; phenol-d5=10%-110%; 2-chlorophenol-d4=33%-110%; and 2-fluorobiphenyl=43%-116%), suggesting a potential high bias in the associated sample results. Because the surrogate recoveries are greater than the upper limit and all of the sample results are nondetect, the results for all samples will be acceptable for use without qualification. The serial dilution test for sample LR-11A-T01N-SFW was applicable for 0 of the 24 metals. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment.
Field QC • Field Duplicate • Rinsate Blank RB02T-SOL 10/17 RB01T-SOL 10/17 RB01T-SOL 10/21 • Field Blank FB01T-SOL 10/17 FB02T-SOL 10/17 • Trip Blank TB56T-SOL TB53T-SOL TB48T-SOL TB33T-SOL TB55T-SOL TB50T-SOL TB49T-SOL TB57-SOL TB46-SOL TB47T-SOL TB45-SOL • Other (e.g., splits)	No	There were a few detections in the various field quality control blanks (RB, FB, and TB). These are summarized in Tables 1.2, 1.3, and 1.4. The RB, FB, and TB results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the associated matrix (i.e., soils).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	The LCS results for metals, semivolatiles organic compounds, explosives, and pesticides were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial and continuing calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (MS)	4.8	---	---	---	---	3.0	RB02T-SOL 10/17	U CCB-I
Boron (P)	---	---	---	5.1	-10.08	4.8	RB01T-SOL 10/17, RB01T-SOL 10/21, RB02T-SOL 10/17	UJ MB and CCB-L
Iron (P)	---	---	---	---	23.11	22.6	RB01T-SOL 10/17, RB02T-SOL 10/17	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Positive Results for Rinsate Blanks

Sample	Ammonia (mg/L)	Phosphorus (mg/L)	Cu (µg/l)	Pb (µg/l)	Ni (µg/l)	Carbon Disulfide (µg/l)	Chloroform (µg/l)	Bis (2-ethylhexyl) phthalate (µg/l)
RB01T-SOL 10/17	0.089	ND	ND	ND	ND	1	5	2
RB02T-SOL 10/17	0.078	0.015	ND	ND	0.29	ND	2	5
RB01T-SOL 10/21	ND	0.12	0.42	0.26	ND	ND	4	4

ND=Nondetect

Table 1.3
Positive Results for Field Blanks

Sample	Chloroform (µg/l)
FB02T-SOL	4

Table 1.4
Positive Results for Trip Blanks

Sample	Chloroform (µg/l)
TB48T-SOL	4

Table 1.5
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
09/10/02 (1113)	Benzaldehyde	34.0%	TB02T-SOL, RB01T-SOL 1017, FB01T-SOL, RB01T-SOL 1021	UJ ICAL-I

Table 1.6
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
10/23/02 (1117)	Acetone 2-Butanone 2-Hexanone	60.2% 51.9% 48.8%	TB56T-SOL, TB53T-SOL, TB48T-SOL, FB02T-SOL, TB33T-SOL, TB55T-SOL, RB01T-SOL, TB50T-SOL, TB49T-SOL	UJ CCAL-I
10/26/02 (0547)	Dichlorodifluoromethane Trichlorofluoromethane 1,1,2-Tirchloro-1, 2,2-trifluoromethane 2-Butanone	-28.1% -29.6% -32.5% -26.8%	RB02T-SOL, TB56T-SOLRE	UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
10/24/02 (0758)	2-Chloronaphthalene 1, 1'-Biphenyl 2,4-Dinitrophenol 3,3'-Diclorobenzidine Di-n-octylphthalate	33.6% 33.0% 26.3% 27.2% -30.4%	RB02T-SOL, RB01T-SOL 1017, FB01T-SOL	UJ CCAL-I
10/30/02 (1504)	Benzaldehyde 4,6-Dinitro-2-methylphenol Pentachlorophenol Anthracene Benzo (k) fluoranthene Bibenz (a,h) anthracene	33.2% 26.7% 28.4% 36.3% 32.4% 27.2%	RB01T-SOL 1021	UJ CCAL-I

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT013 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data validationer: Ansley Watson Date Completed: 6/2/03

Peer Reviewer: Alan Roberts Date Completed: 6/3/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RB01T-SOL	RB	506996	RB01T-SOL1022 or RB01TSOL1022	W	X	X	X	X	X		X
TB64T-SOL	TB	506997		W			X				
FB01T-SOL	FB	506998	FB01TSOL1022	W			X	X			X
TB44T-SOL	TB	506999		W			X				
TB60T-SOL	TB	507000		W			X				
TB42T-SOL	TB	507001		W			X				
TB63T-SOL	TB	507002		W			X				
TB54T-SOL	TB	057003		W			X				
RB01T-SOL	RB	507207	RB01T-SOL1023 or RB01TSOL1023	W	X	X	X	X			X
RB02T-SOL	RB	507208	RB02T-SOL1023	W		X		X	X		
FB01T-SOL	FB	507209	FB01TSOL1023	W			X	X			X
FB02T-SOL	FB	507210		W				X	X		
TB65T-SOL	TB	507211		W			X				
TB59T-SOL	TB	507212		W			X				
TB62T-SOL	TB	507213		W			X				

Matrix: W = Water

QC Type: TB = Trip Blank RB = Rinsate Blank FB = Field Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

This package did not initially include the ion chromatography (IC) initial calibration from 10/02/02, which was used to calculate the reported sample results. A copy of this curve was provided by the

laboratory at a later date and incorporated into the data package. The 10/13/02 curve included in the package was considered invalid and was not saved by the laboratory data system. The 10/13/02 curve included in the package should be disregarded.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. After the error was discovered, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

It was noted in the laboratory case narrative that the ICP/MS analysis of the laboratory control sample (LCS) in selenium yielded a slightly low percent recovery, 73.8%, out of the acceptance limits of 75-125. Because the LCS recovery is less than the lower limit but ≥30%, the selenium results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample TB63T-SOL was accidentally written on the COC as TB36T-SOL. The laboratory was contacted and the correction was made so that the sample was logged in with the correct field ID.
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, boron, copper, molybdenum, selenium, 1,2,4-trichlorobenzene, and 1,2-dibromo-3-chloropropane were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned to positive blank results and a low bias was assigned to all negative blank values.
Matrix QC • MS • MS/MSD • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates PDS/GFAA QC • Serial Dilution • RB01T-SOL1022L • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery for the volatile organic compounds analysis was high in samples TB54T-SOL, TB59T-SOL, and TB62T-SOL. The recoveries of 1,2-dichloroethane-d4 were 115%, 116%, and 117%, respectively. These recoveries were outside the acceptance range of 76%-114%, suggesting a potential high bias in the associated sample results. Because the surrogate recoveries are greater than the upper limit and all of the sample results are nondetect, the results for all samples will be acceptable for use without qualification. The surrogate recovery for the semi-volatile organic compounds analysis was high in samples RB01T-SOL 10/22 (2-fluorophenol=111%), RB01T-SOL 10/23 (2,4,6-tribromophenol=124%), FB01T-SOL 10/23 (phenol-d5=115%, 2-chlorophenol-d4=114%, and 2,4,6-tribromophenol=125%), and FB02T-SOL 10/23 (phenol-d5=114%, 2-chlorophenol-d4=113%, and 2,4,6-tribromophenol=128%). These recoveries were outside the acceptance range (2-fluorophenol 21%-110%, 2,4,6-tribromophenol 10%-123%, phenol-d5 10%-110%, and 2-chlorophenol-d4 33%-110%), suggesting a potential high bias in the associated sample results. Because the surrogate recoveries are greater than the upper limit and all of the sample results are nondetect, the results for all samples will be acceptable for use without qualification.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The serial dilution test was not applicable for the 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL (adjusted for dilution). It was therefore not necessary to qualify any results in this sample on the basis of serial dilutions. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment.
Field QC • Field Duplicate • Rinsate Blank RB01T-SOL 10/22 RB01T-SOL 10/23 RB02T-SOL 10/23 • Field Blank FB01T-SOL 10/22 FB01T-SOL 10/23 FB02T-SOL 10/23 • Trip Blank TB64T-SOL TB44T-SOL TB60T-SOL TB42T-SOL TB63T-SOL TB54T-SOL TB65T-SOL TB59T-SOL TB62T-SOL • Other (e.g., splits)	No	There were a few detections in the various field quality control blanks (RBs and FB). These are summarized in Tables 1.3, and 1,4. The RB and FB results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Initial Calibration	No	The relative response factor for the series of calibration standards for benzaldehyde exceeded the maximum % relative standard deviation of 30% for SVOC. Table 1.5 summarize the initial calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Continuing Calibration	No	The relative response factor for the series of calibration standards for exceeded the maximum % difference of 25%. Table 1.6 summarize the continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues.
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	No	The metals LCS yielded a slightly low percent recovery in selenium (LCS=73.8%). Because the recovery is less than the lower limit (75-125%) but >30%, the selenium results for all samples have been qualified as estimated (UJ/J). The semi-volatile organic compounds LCS and LCSD yielded a slightly high percent recovery in target analytes 4-nitrophenol (LCS=83%, LCSD=91%), and Pentachlorophenol (LCSD=112%). Because the recoveries are greater than the acceptance limits (4-nitrophenol = 10%-88%, pentachlorophenol = 9%-103%) and all of the sample results are nondetect, the LCS and LCSD results for all samples are considered acceptable for use without qualification. The nitroaromatics analysis of LCS and LCSD yielded a slightly low percent recovery (LCS=58%, LCSD=62%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time; therefore the laboratory applied the default range of 70-130%. Because the LCS recoveries are less than the lower limit but >30%, the PYX results for all samples have been qualified as estimated (UJ/J). The PCB analysis of LCS and LCSD yielded a slightly high percent recovery in non-target analytes gamma-BHC (LCS=130%), Aldrin (LCS=124%), Dieldrin (LCS=130%, LCSD=130%), Endrin (LCS=150%, LCSD=140%), and 4,4'-DDT (LCS=140%, LCSD=130%). Because the recoveries are from non-target analytes, no qualification of the target analytes (PCBs) was required.
Compound Identification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	Information regarding the ICP/MS mass calibration and resolution are not available due to the software limitations. However, acceptable performance can be inferred from the other QC sample results, which satisfied evaluation criteria. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)
RB01T-SOL 10/22	1.0 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Boron (P)	6.9	5.6	7.6	---	4.8	RB01T-SOL 10/22, RB01T-SOL 10/23	U CCB-I
Copper (MS)	---	---	---	-0.364	0.30	RB01T-SOL 10/22, RB01T-SOL 10/23	UJ MB-L
Molybdenum (MS)	0.3	---	---	---	0.20	RB01T-SOL 10/23	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Positive Results for Rinsate Blanks

Sample	Ammonia (mg/L)	Boron (µg/l)	Molybdenum (µg/l)	Acetone (µg/l)	Chloroform (µg/l)	Bis (2-ethylhexyl) phthalate (µg/l)
RB01T-SOL 10/22	0.048	5.8	ND	2	4	---
RB01T-SOL 10/23	0.072	5.4	0.41	ND	6	7
RB02T-SOL 10/23	0.054	---	---	---	---	3

ND=Nondetect

Table 1.4
Positive Results for Field Blanks

Sample	Chloroform (µg/l)	Methylene Chloride (µg/l)	Bis (2-ethylhexyl) phthalate (µg/l)
FB01T-SOL 10/22	7	ND	6
FB01T-SOL 10/23	5	1	---
FB02T-SOL 10/23	---	---	22

ND=Nondetect

Table 1.5
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC ICAL Date/Time	Analyte	RSDs >30%	Action	Qualification and Qualification Codes
9/10/02 (1406)	Benzaldehyde	34%	Results for this analyte in all samples associated with this calibration event were qualified as estimated.	J ICAL-I or UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.6
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
10/28/02 (2041)	Acetone 2-Butanone 2-Hexanone	48.7% 38.8% 37.5%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
10/30/02 (1504)	Benzaldehyde 4,6-dinitro-2-methylphenol Pentachlorophenol Anthracene Benzo (k) fluoranthene Dibenz (a, h) anthracene	33.2% 26.7% 28.4% 36.3% 32.4% 27.2%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I
10/31/02 (1218)	Benzaldehyde Anthracene Benzo (k) fluoranthene Dibenz (a, h) anthracene	46.7% 27.2% 25.5% 26.1%	**Results for these analytes in associated samples were qualified as estimated.**	UJ CCAL-I
PCB/Pesticide CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
11/13/02 (0542)	4,4-DDT Methoxychlor	-40.0% -40.0%	Results for these analytes were not reported; therefore no qualification was necessary.	NONE

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT014 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Validationer: Ansley Watson Date Completed: 12/15/02

Peer Reviewer: Stacey Coker Date Completed: 12/16/02

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	lab. ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RB01T-SOL	RB	507463		W	X	X	X	X			
TB66T-SOL	TB	507602		W			X				
TB21T-SOL	TB	507603		W			X				
TB61T-SOL	TB	507604		W			X				
MWA-T01N-GRW	SA	507789		W	X	X	X				
MWA-D01N-GRW	SA	507790		W	X						
MWB-T01N-GRW	SA	507791		W	X	X					
MWB-D01N-GRW	SA	507792		W	X						
RB01T-SOL	RB	507793		W	X	X	X	X			
FB01T-SOL	FB	507794		W			X	X			
FB03T-SOL	FB	507795		W			X	X			
FB02T-SOL	FB	507796		W			X	X			
FB04T-SOL	FB	507797		W				X	X		
RB03T-SOL	RB	507798		W	X	X	X	X			
TB19T-SOL	TB	507799		W			X				
RB02T-SOL	RB	507800		W	X	X	X	X	X		
TB43T-SOL	TB	507801		W			X				
TB31T-SOL	TB	507802		W			X				
RB01T-SOL	RB	507972		W	X	X	X	X			
FB01T-SOL	FB	507973		W			X	X			
MW-14-T01N-GRW	SA	507974		W	X	X					
MW-14-D01N-GRW	SA	507975		W	X						
TB41T-SOL	TB	507976		W			X				

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank

[1] the matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

This package did not initially include the ion chromatography (IC) initial calibration from 10/02/02, which was used to calculate the reported sample results. A copy of this curve was provided by the laboratory at a later date and incorporated into the data package. The 10/13/02 curve included in the package was considered invalid and was not saved by the laboratory data system. The 10/13/02 curve included in the package should be disregarded.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. After the error was discovered, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

For the majority of samples in this SDG, the volatile organic surrogate monitoring compound 1,2-dichloroethane-d4 exceeded control criteria. However, no target analytes were detected in any of these samples.

The semi-volatile organics analyses of the blank spike samples associated with this SDG exhibited generally acceptable recoveries with the exception of select compounds that marginally exceeded control criteria.

The nitroaromatic analysis of the blank spike samples associated with this SDG yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded recoveries below the default control limits. Please note that at this time the laboratory has not established control charted limits for this compound.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, and Orthophosphate were not met. Table 1.1 summarizes the holding time detections and the resultant data qualifications. Results for hold time reflect an indeterminate bias.
Laboratory Blank Results	No	Copper, iron, and selenium were detected in various blanks. Table 1.2 summarizes the blank detentions and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MS/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates FB04T-SOL • Serial Dilution RB01T-SOL1024 • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	In the explosives analysis, the surrogate recovery was low in one sample. For sample FB04T-SOL, the recovery of 1,2-dinitrobenzene, 84% was outside the range of 85%-116%, suggesting a potential low bias in the associated sample results. Therefore, all positive and non-detect explosive compound results for sample FB04T-SOL were qualified as estimated ("J/UJ"). The serial dilution test for sample RB01T-SOL 10/24 was applicable for 0 of the 24 metals. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. For sample MWB-D01N-GRW, the absolute value for the anion/cation balance results was high. The percent difference was –23.3%, outside the acceptance range of ±13%.
Field QC • Field Duplicate • Rinsate Blank RB01T-SOL 10/24 RB01T-SOL 10/27 RB01T-SOL 10/28 RB02T-SOL 10.27 RB03T-SOL 10.27 • Field Blank FB01T-SOL 10/27 FB01T-SOL 10/28 FB02T-SOL FB03T-SOL FB04T-SOL • Trip Blank TB19T-SOL TB21T-SOL TB31T-SOL TB41T-SOL TB43T-SOL TB61T-SOL TB66T-SOL • Other (e.g., splits)		There were a few detections in the rinsate blanks (RB) for soil samples. These are summarized in Table 1.3. The RB results for solid for the Fall 2002 event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. There were a few detections in the field blanks (FB) for soil samples. These are summarized in Table 1.4. The FB results for solid for the Fall 2002 event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	As noted in the case narrative, some semi-volatile organic LCS recoveries were high. For 4-nitrophenol, the LCS and LCSD recoveries were 83% and 91%, respectively, outside the CLP acceptance range of 10-80%. As these recoveries are less than 100%, they are not considered by the reviewer to imply a high bias in associated sample results. Similarly, the LCD recovery of pentatchlorophenol was 112%, outside the CLP acceptance range of 9-103%. As all acid fraction results for samples were nondetect, data qualification was not necessary based on these LCS results. As noted in the case narrative, the LCS and LCSD recoveries for one compound were low. The LCS and LCSD recoveries of PYX were 58% and 62%, respectively, outside the QAPP acceptance range of 75-125%. As such, all PYX results were qualified as estimated (J or UJ) with a potential low bias. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial and continuing calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)
MWA-T01N-GRW	1.0 UJ	0.005 UJ	0.010 UJ
MWB-T01N-GRW	1.0 UJ	0.005 UJ	0.18 J
RB01T-SOL 10/27	1.0 UJ	---	---
RB03T-SOL	1.0 UJ	---	---
RB02T-SOL	1.0 UJ	---	---
RB01T-SOL 10/28	1.0 UJ	---	---
MW-14-T01N-GRW	1.0 UJ	0.005 UJ	0.015 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB 1 (µg/l)	MB 2 (µg/l)	IDL	Samples Qualified	Qualification Codes
Copper (MS)	---	---	---	---	-0.364 Associated with sample RB01T-SOL 10/24 only.	0.566 Associated with all other metal samples in this SDG.	0.20	MWA-T01N-GRW, MWA-D01N-GRW, MWB-T01N-GRW, RB01T-SOL 10/27 RB03T-SOL, MW-14-T01N-GRW	U MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB 1 (µg/l)	MB 2 (µg/l)	IDL	Samples Qualified	Qualification Codes
Iron (P)	51.8	68.7	66.8	---	---	---	22.6	MWB-D01N-GRW, MW-14-T01N-GRW	U CCB-I
Selenium (MS)	---	0.2	---	---	---	---	0.2	MWA-T01N-GRW, MWA-D01N-GRW, RB02T-SOL, MW-14-D01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank MB=Method Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Rinsate Blank Results

Analyte	RB01T-SOL 10/24 (µg/l)	RB01T-SOL 10/27 (µg/l)	RB01T-SOL 10/28 (µg/l)	RB02T-SOL (µg/l)	RB03T-SOL (µg/l)	RL
Ammonia	0.062	0.15	0.093	0.14	0.077	0.40
Phosphate	U	U	U	0.049	0.035	0.010
TOC	1.2	U	U	U	U	1.0
Aluminum (MS)	42.5	U	U	U	U	3.0
Chloroform	5	6	6	4	6	10
Di-n-butylphthalate	0.5	U	U	U	U	11
Bis (2-Ethylhexyl) phthalate	5	4	7	1	5	11

P= ICP MS=ICP-MS RL= Reporting Limit

Table 1.4
Field Blank Results

Analyte	FB01T-SOL 10/27 (µg/l)	FB01T-SOL 10/28 (µg/l)	FB02T-SOL (µg/l)	FB03T-SOL (µg/l)	FB04T-SOL (µg/l)	RL
Chloroform	7	6	5	5	NA	10
Bis (2-Ethylhexyl) phthalate	10	1	2	1	U	11

P= ICP MS=ICP-MS RL= Reporting Limit

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT015 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 12/15/02

Peer Reviewer: Stacey Coker (Stacey Malerba) Date Completed: 12/16/02 (revised 08-30-06)

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
MW-7A-T01N-GRW	SA	508219		W	X	X					
MW-7A-D01N-GRW	SA	508220		W	X						
MW-7A-T01D-GRW	FD	508221		W	X	X					
MW-7A-D01D-GRW	FD	508222		W	X						
MW-9A-T01N-GRW	SA	508223		W	X	X					
MW-9A-D01N-GRW	SA	508224		W	X						
MW-10-T01N-GRW	SA	508225		W	X	X					
MW-10-D01N-GRW	SA	508226		W	X						
MW-7C-T01N-GRW	SA	508227		W	X	X[4]					
MW-7C-D01N-GRW	SA	508228		W	X						
MW-7C-T01N-GRW	SA	508229		W	X[3]	X[4]					
TB35T-SOL	TB	508230		W			X				
MW-4-T01N-GRW	SA	508231		W	X	X					
MW-4-D01N-GRW	SA	508232		W	X						
RB01T-SOL	RB	508233		W	X	X					
RB01D-SOL	RB	508234		W	X						
RB01T-SOL	RB	508648		W	X	X					
RB02T-SOL	RB	508649		W	X	X					
RB03T-SOL	RB	508640		W	X	X					

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.
[3] Cyanide only
[4] Partial list

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. After the error was discovered, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

The ammonia analysis of the blank spike duplicate sample associated with the samples analyzed 11/25/02 yielded a percent recovery that was below the established control limits. The associated blank spike analysis exhibited acceptance recovery.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There was one problem noted with sample receipt. The cooler for this SDG was accidentally shipped to the wrong laboratory. The following day the cooler was shipped to the correct laboratory, however, many of the holding times for the inorganics were not met.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, and Orthophosphate were not met. Table 1.1 summarizes the holding time qualifications. Results qualified for holding times are considered to have an indeterminate bias direction.
Laboratory Blank Results	No	Aluminum, copper, and iron were detected in various blanks. Table 1.2 summarizes the blank detentions and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MW-7A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	For sample MW-4-T01N/D01N-GRW, the absolute values for the anion/cation balance results was high. The percent difference was -14.4%, outside the acceptance range of ±13%. The serial dilution test for sample MW-7A-T01N-GRW was applicable for 4 of the 24 metals. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. The orthophosphate and phosphorus results for sample MW-7A-T01N-GRW were qualified as estimated (J/UJ TVP-I) because the orthophosphate result was greater than the phosphorus result. While evaluating the alkalinity results, it was observed that the sum of the alkalinity forms was greater than total alkalinity for samples MW-4-T01N-GRW and MW-7C-T01N-GRW. The reviewer examined the raw data and found that the hydroxide alkalinity results reported on the Form 1s for these two samples were incorrect. The raw data indicates that the hydroxide alkalinity results for these samples should have been reported as nondetect with a reporting limit of 1.0 mg/L. The data sheets were hand-corrected and the database was updated accordingly.
Field QC • Field Duplicate (FD) MW-7A-T01D-GRW MW-7A-D01D-GRW • Rinsate Blank (RB) RB01T-GRW RB01D-GRW	No	This package included field duplicate (FD) samples that were slightly outside the control criteria as summarized in Table 1.3. Also, there were a few detections in the field quality control blanks (RB). These are summarized in Tables 1.4. The field quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
RB01T-SOL RB02T-SOL RB03T-SOL • Field Blank (FB) • Trip Blank (TB) TB35T-SOL • Other (e.g., splits)		
Non-detect Results w/ Elevated RLs?	Yes	Many nitrate results were reported as nondetect with a dilution factor of 2.0. As such the reporting limit is 0.40 mg/l. However, this reporting limit is below the QAPP required reporting limit of 0.5 mg/l. As such, there should not be any affect on the usability of the data.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The case narrative noted that the 11-25-02 ammonia LCS and LCSD recoveries were slightly outside established control limits. The recoveries were 94.3% and 56.7%, respectively, outside the QAPP acceptance range of 75-125%. As such, all ammonia results reported from the 11-25-02 run were qualified as estimated (J or UJ) with a potential low bias. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial and continuing calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)
MW-7A-T01N-GRW	0.40 UJ	0.005 UJ	0.25 J
MW-7A-T01D-GRW	0.40 UJ	0.005 UJ	0.032 J
MW-9A-T01N-GRW	0.45 J	0.005 UJ	0.012 J
MW-10-T01N-GRW	0.40 UJ	0.005 UJ	0.020 J
MW-7C-T01N-GRW	0.40 UJ	0.005 UJ	0.050 J
MW-4-T01N-GRW	0.40 UJ	0.005 UJ	0.014 J
RB01T-GRW	0.45 J	0.005 UJ	0.010 UJ
RB01T-SOL	0.40 J	---	---
RB02T-SOL	0.40 J	---	---
RB03T-SOL	0.40 J	---	---

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Codes
Aluminum (MS)	-6.9	-6.9	-6.8	-6.6	-7.544	3.0	MW-7A-T01N-GRW, MW-7A-D01N-GRW, MW-7A-T01D-GRW, MW-7A-D01D-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW, MW-10-D01N-GRW, MW-7C-D01N-GRW, MW-4-T01N-GRW, MW-4-D01N-GRW, RB01T-GRW, RBO1D-GRW, RB02T-SOL, RB03T-SOL	UJ/J MB, CCB – L
Copper (MS)	---	---	---	---	0.736	0.20	MW-7A-D01N-GRW, MW-7A-T01D-GRW, MW-9A-T01N-GRW, MW-10-T01N-GRW, MW-10-D01N-GRW, MW-7C-T01N-GRW, MW-7C-D01N-GRW, RB01T-GRW, RB01T-SOL	U CCB-I
Iron (P)	-33.2	---	---	---	---	22.6	MW-7A-T01N-GRW, MW-7A-D01N-GRW, MW-7A-T01D-GRW, MW-7A-D01D-GRW, MW-9A-T01N-GRW, MW-9A-D01NGRW, MW-10-T01N-GRW, MW-10-D01N-GRW, MW-7C-T01N-GRW, MW-7C-D01N-GRW, MW-4-D01N-GRW, RB01T-GRW, RB01D-GRW, RB01T-SOL, RB02T-SOL, RB03T-SOL	UJ/J MB, CCB – L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank MB=Method Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	MW-7A-T01N-GRW	MW-7A-T01D-GRW	Criteria Comment	Outside Criteria	RL	Action
Orthophosphate (mg/l)	0.25	0.032	Abs. Diff. <2xRL (0.02)	Abs Diff.=0.218	0.01	J FD-L parent

Table 1.4
Positive Rinsate Blank Results

Analyte	RB01T-GRW	RB01D-GRW	RB01T-SOL	RB02T-SOL	RB03T-SOL	RL
Aluminum (MS) (µg/l)	---	---	58.8	23.4	16.7	3.0
Copper (MS) (µg/l)	3.6	---	0.59	---	---	0.30
Selenium (MS) (µg/l)	---	0.20	---	---	---	0.20
Total Kjeldahl Nitrogen (mg/L)	0.24	---	0.24	0.24	---	0.24
Ammonia (mg/L)	0.32	---	0.81	0.81	---	0.40
Chloride (mg/L)	23.0	---	---	---	---	0.40
Nitrate (mg/L)	0.45	---	---	---	---	0.40
Phosphate (mg/L)	---	---	0.056	0.030	0.013	0.010
TDS (mg/L)	45.0	---	---	---	---	5.0

P= ICP MS=ICP-MS RL= Reporting Limit

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT016 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data validationer: A. Watson/S. Coker Date Completed: 12/9/02 and 12/14/02

Peer Reviewer: S. Coker/A. Roberts Date Completed: 12/14/02 and 12/18/02

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
MW-12-T01N-GRW	SA	508651		W	X	X					
MW-12-D01N-GRW	SA	508652		W	X						
MW-11-T01N-GRW	SA	508653		W	X	X					
MW-11-D01N-GRW	SA	508654		W	X						
MW-13-T01N-GRW	SA	508655		W	X	X					
MW-13-D01N-GRW	SA	508656		W	X						
MW-15-T01N-GRW	SA	508657		W	X	X					
MW-15-D01N-GRW	SA	508658		W	X						
RB01T-SOL	RB	508680		W	X	X					
RB02T-SOL	RB	508681		W	X	X					
RB03T-SOL	RB	508682		W	X	X					
RB04T-SOL	RB	508683		W	X	X					
MMW-17B-T01N-GRW	SA	508684		W	X	X					
MMW-17B-D01N-GRW	SA	508685		W	X						
MMW-23A-T01N-GRW	SA	508686		W	X	X					
MMW-23A-D01N-GRW	SA	508687		W	X						
MMW-23B-T01N-GRW	SA	508688		W	X	X					
MMW-23B-D01N-GRW	SA	508689		W	X						

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3. This was the result of a calculation error in which the concentration of stock calibration standard was inadvertently calculated based on NO_3 instead of N. After the error was discovered, the raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. As such, the raw data results must be multiplied by 0.2259 in order to verify the nitrate results reported on the hard copy data sheet.

During the alkalinity analysis of the samples in this SDG, the associated blank sample yielded an alkalinity concentration that was marginally above the laboratory's reporting limit. However, the concentration was less than the reporting limit listed in the QAPP. As such, the blank results were reported from this analysis.

The cobalt results for samples MMW-23A-T01N-GRW and MMW-23A-D01N-GRW were reported from a Trace ICP analysis performed at a five times dilution due to the presence of interference that the laboratory suspects was suppressing the cobalt result. The laboratory suspects that this interference is likely due to the large amount of manganese in these samples. Manganese in high concentrations is known to interfere with the recovery of other elements as well. Thus, for these samples, it was also necessary to report cadmium, molybdenum, antimony, and selenium from the trace ICP instrument due to interference present during the ICP/MS analyses (as indicated by some high internal standard recoveries).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The cooler shipment was inadvertently shipped to another project laboratory because the wrong pre-printed air-bill was used. This laboratory forwarded the coolers to STL Burlington the following day.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, and Ortho-phosphate were not met. Table 1.1 summarizes the resultant data qualifications. These results qualified for holding time are considered to have an indeterminate bias.
Laboratory Blank Results	No	Aluminum, antimony, boron, cobalt, iron, lead, potassium, molybdenum, and selenium were detected in various blanks. Table 1.2 summarizes the blank detentions and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS MMW-17B-T01N-GRW MMW-17B-D01N-GRW • LD MMW-17B-T01N-GRW MMW-17B-D01N-GRW	No	For matrix spike analysis on sample MMW-17B-T01N-GRW, the recoveries of alkalinity, selenium, molybdenum, and cyanide were low. Similarly, for the matrix spike analysis on sample MMW-17B-D01N-GRW, the recovery of molybdenum was low. Table 1.3 summarizes these matrix spike results and the resultant data qualifications. For laboratory duplicate analysis of sample MMW-17B-T01N-GRW, the iron results did not meet acceptance criteria. Table 1.4 summarizes these results and the resultant data qualifications.
Method QC • Surrogates • Serial Dilution MMW-17B-T01N-GRW MMW-17B-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution test for sample MMW-17B-T01N-GRW was applicable for 7 of the 24 metals. Of these 7 metals, the percent difference for 1 exceeded the evaluation criteria of ≤ 10%. Table 1.5 summarizes these results and data qualification issued. The serial dilution test for sample MMW-17B-D01N-GRW was applicable for only 7 of the 24 metals. Of these 7 metals, the percent difference for 2 exceeded the evaluation criteria of ≤ 10%. Table 1.5 summarizes these results and data qualification issued. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		Recoveries for two internal standards (Y and Tb) were high for the ICPMS analysis of samples MMW-23A-T01N-GRW and MMW-23A-D01N-GRW. As noted in the case narrative comments, the laboratory suspects that the high manganese concentrations in these samples to be the cause. As the interference was significant (i.e., not likely to be managed by dilution), the laboratory opted to report results for all analytes associated with affected internal standards from the trace ICP instrument. As such, data qualification on the basis of high internal standards was not necessary. For samples MMW-17B-T01N/D01N-GRW and MMW-23A-T01N/D01N-GRW, the percent difference between the anion/cation balance was -24.90 and –58.59, respectively, outside the acceptance range of ±13%. Review of the result indicated that the sulfate milliequivalent result on the anion side is higher than the milliequivalent total of the cation results. Review of results from other samples indicates a generally high bias in the sulfate results. The pH of the samples were 4.44 and 5.33 respectively. Evaluation of the results relative to measured and calculated total dissolved solids speciation of the sulfate ion at lower pH's indicates that the sulfate analyses were likely biased high. The sulfate result will consequently be qualified as "J TvP-H". For sample MW-15-T01N/D01N-GRW, the percent difference between the anion/cation balance was –22.37, outside the acceptance range of ±13%. Review of the result indicated that the sulfate milliequivalent result on the anion side is higher than the milliequivalent total of the cation results. Review of results from other samples indicates a generally high bias in the sulfate results. The sulfate result has therefore been qualified as "J TvP-H".
Field QC • Field Duplicate • Rinsate Blank RB01T-SOL 10/31 RB02T-SOL 10/31 RB03T-SOL 10/31 RB04T-SOL 10/31 • Field Blank • Trip Blank • Others (e.g., splits)	No	There were a few detections in the rinsate blanks (RB) associated with soil samples. These are summarized in Table 1.6. The RB results for soils for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Besides results qualified as nondetect on the basis of method blanks (in which case the reported value becomes the "effective" reporting limit), there were two samples with nondetect results with elevated reporting limits. For samples MMW-23A-T01N-GRW and MMW-23A-D01N-GRW, antimony was reported as nondetect with a reporting limit of 33.5 ug/l. These results were reported from the trace ICP rather than the ICPMS due to interferences caused by the sample matrix. The typical antimony reporting limits for the trace ICP and the ICPMS instruments are 6.7 and 0.20 ug/l, respectively. The QAPP required RL is 0.7 ug/l. These antimony results will not be usable for comparing to the following human health decision criteria: New Mexico MCL of 6 ug/l (total), EPA R6 Tap Water Screening Criterion of 1.5 ug/l (total), or the Water and Organism Standard of 14 ug/l (dissolved).
Package Completeness	No	The analytical package was evaluated for completeness and it was noted in the inorganics that phosphorus was accidentally written as phosphate. The phosphate line was crossed out and correctly revised by hand on the original form 1.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	In addition to sample specific parameters, laboratory performance parameters were reviewed for this package. The results of this evaluation are provided below.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	No	Although beryllium for this project was reported from the ICP, the data validationer noted that the ICPMS internal standard, 89Y, used to quantitate 9Be was more that 50 amus from the analyte. For all other elements reported from the ICP/MS, the associated internal standard was within 50 amus of the analyte. As such, this issue is not considered to affect the quality or usability of the data reported from the ICPMS.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	Information regarding the mass resolution is not available due to software limitations. However, acceptable mass resolution can be inferred from the other QC sample results which satisfied all evaluation criteria.

Table 1.1
Holding Time Qualifications

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)
MW-12-T01N-GRW	0.40 UJ	0.005 UJ	0.020 J
MW-11-T01N-GRW	0.43 J	0.005 UJ	0.010 UJ
MW-13-T01N-GRW	0.52 J	0.005 UJ	0.010 UJ
MW-15-T01N-GRW	0.40 UJ	0.005 UJ	0.017 J
MMW-17B-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ
MMW-23A-T01N-GRW	1.0 UJ	0.005 UJ	0.010 UJ
MMW-23B-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	MB (µg/l)	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	IDL	Samples Qualified	Qualification Codes
Aluminum (MS)	3.1	4.2	---	---	---	---	3.0	MW-12-D01N-GRW, MW-11-T01N-GRW, MW-11-D01N-GRW, MW-13-T01N-GRW, MW-13-D01N-GRW, MW-15-D01N-GRW, RB02T-SOL, RB03T-SOL, MMW-23B-D01N-GRW	U MB-I U MB, CCB-I
Antimony (MS)	---	0.4	0.4	0.4	0.4	---	0.20	RB01T-SOL, MMW-17B-D01N-GRW	U CCB-I
Iron (P)	25.4	---	---	---	---	---	22.6	MW-11-T01N-GRW, MW-11-D01N-GRW, MW-13-T01N-GRW, MW-13-D01N-GRW, MW-15-T01N-GRW, MW-15-D01N-GRW, RB01T-SOL, RB02T-SOL, RB03T-SOL, MMW-17B-D01N-GRW, MMW-23B-D01N-GRW	U MB-I
Lead (MS)	0.28	---	---	---	---	---	0.10	MW-11-T01N-GRW, MW-13-T01N-GRW, MW-15-T01N-GRW, MMW-17B-T01N-GRW, MMW-17B-D01N-GRW, MMW-23A-T01N-GRW, MMW-23A-D01N-GRW, MMW-23B-D01N-GRW	U MB-I
Molybdenum (MS)	---	0.5	---	---	---	---	0.20	MW-15-T01N-GRW, MW-15-D01N-GRW	U CCB-I
Selenium (MS)	---	---	---	---	0.3	---	0.20	MW-12-D01N-GRW, MW-11-T01N-GRW, MW-11-D01N-GRW, MW-13-T01N-GRW, MW-13-D01N-GRW, MW-15-D01N-GRW, MMW-17B-T01N-GRW, MMW-17B-D01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank MB= Method Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Qualifications for Metals and Inorganics

Sample/ Analytes	MS %R	PDS %R	Criteria	Comment	Action
MMW-17B-T01N-GRW					
Carbonate Alkalinity	70.9	NA	75-125%	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery.	No qualification
Hydroxide Alkalinity	70.9	NA		Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery.	No qualification
Bicarbonate Alkalinity	70.9	NA		Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery.	No qualification
Total Alkalinity	70.9	NA		Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery.	No qualification
Selenium	73.6	82.5		NONE	J MS-L parent
Molybdenum	72.9	69.3		NONE	UJ MS, PDS-L parent
Cyanide	60.5	86.9		NONE	UJ MS-L parent
MMW-17B-D01N-GRW					
Molybdenum	74.1	69.5	75-125%	NONE	UJ MS, PDS-L parent

NA = Not appropriate

Table 1.4
Duplicate Qualifications

Sample/Analyte	RPD	Limit	Action
MMW-17B-T01N-GRW			
Iron	69.1%	≤20%	Qualify parent sample J D-L

Table 1.5
Serial Dilution Qualifications

Sample Analyte	%Difference	Action
MMW-17B-T01N-GRW • Zn	11.1%	The parent sample was qualified J/UJ DL-H.
MMW-17B-D01N-GRW • Al • Mn	13.1% 11.8%	The parent sample was qualified J/UJ DL-H.

Table 1.6
Positive Results for Rinsate Blanks

Analyte	RB01T-SOL	RB02T-SOL	RB03T-SOL	RB04T-SOL	RL
Ammonia (mg/L)	0.083	0.048	0.063	0.067	0.040
Fluoride (mg/L)	0.14	0.10	---	---	0.10
Total Organic Carbon (mg/L)	1.1	---	1.5	1.5	1.0
Total Kjeldahl Nitrogen (mg/L)	---	---	---	0.55	0.24
Analyte	**RB01T-SOL**	**RB02T-SOL**	**RB03T-SOL**	**RB04T-SOL**	**IDL**
Copper (MS)	U	0.70	U	0.40	0.30

MS = ICP-MS RL = Reporting Limit IDL=Instrument Detection Limit U=Nondetect

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT017 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 12/15/02

Peer Reviewer: Stacey Coker Date Completed: 12/16/02

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
TB68T-SOL	TB	508690		W			X				
MMW-34B-T01N-GRW	SA	508691	MW34BT01NGRW or MMW34BT01NGRW	W	X	X	X	X	X		
MMW-34B-D01N-GRW	SA	508692		W	X						
MMW-36B-T01N-GRW	SA	508693	MW36BT01NGRW or MMW36BT01NGRW	W	X	X	X	X	X		
MMW-36B-D01N-GRW	SA	508694		W	X						
TB74T-SOL	TB	508695		W			X				
MMW-13-T01N-GRW	SA	508864		W	X	X			X		
MMW-13-D01N-GRW	SA	508865		W	X						
MW-1-T01N-GRW	SA	508866		W		X					
MW-1-D01N-GRW	SA	508867		W							
MMW-35B-T01N-GRW	SA	508868	MW35BT01NGRW or MMW35BT01NGRW	W	X	X	X	X	X		
MMW-35B-D01N-GRW	SA	508869		W	X						
TB72T-GRW	TB	508870		W			X				
FB01T-GRW	FB	508871	FB01TGRW	W			X	X	X		
MMW-8A-RB02T-GRW	RB	508872	MW8ARB02TGRW or MMW8ARB02TGRW	W	X	X	X	X	X		
MMW-8A-RB02D-GRW	RB	508873		W	X						
MMW-8A-T01N-GRW	SA	508874	8AT01NGRW or MMW8AGRW	W	X	X	X	X	X		
MMW-8A-D01N-GRW	SA	508875		W	X						
MMW-8B-T01N-GRW	SA	508876	MMW8BT01NGRW	W	X	X	X	X	X		
MMW-8B-D01N-GRW	SA	508877		W	X						
TB85T-GRW	TB	508878		W			X				

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3. These raw results have been converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen to the molecular weight of Nitrate.

During the alkalinity analysis of the samples in this SDG performed 11/7/02, the associated blank CCB2, yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the concentration was less than the RL listed in the QAPP, and therefore sample results were reported from this analysis. Additionally, during the analysis performed 11/14/02, the continuing calibration verification sample CCV3 exhibited a percent recovery that exceeded control criteria. Only the samples with concentrations below the reporting limit were reported from this analysis.

During the metals analysis performance 11/28/02 on ICP #4, the associated initial calibration verification analysis yielded a percent recovery for potassium of 110.8%, which marginally exceeded the upper limit of 110%. The associated samples were not re-analyzed.

During cyanide analysis performed 11/9/02, the associated initial calibration verification analysis yielded a percent recovery that exceeded control criteria. Please note that cyanide was not detected above the reporting limit and therefore not further action was taken.

The laboratory control sample recovery of the explosive compound PYX was outside the default control limits. At this time, the laboratory has not established acceptance ranges for this compound from control charts. The resultant data qualification is described in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample receiving forms noted three issues with sample receipt. First, it was determined after shipment that the field sample recorded on the COC as MMW-35-T01N-GRW should have been recorded as MMW-35B-T01N-GRW. Similarly, the rinsate blank sample recorded on the COC as MMW-8A-RB01T-GRW should have been recorded as MMW-8A-RB02T-GRW. The laboratory was notified by fax and the sample was logged in with the correct ID. The lab reported a lack of preservative in the samples MMW-34B-TO1N-GRW, MMW-35B-TO1N-GRW, MMW-36B-TO1N-GRW for cyanide analysis which resulted in the possible loss of cyanide, therefore cyanide results for these samples are qualified as estimated "J" for positive results and "UJ" for nondetects. The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, and Orthophosphate were not met. Table 1.1 summarizes the holding time data qualifications. The associated bias direction is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, arsenic, copper, manganese, molybdenum, and nickel were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD/PDS MMW-8A-T01N-GRW MMW-8A-D01N-GRW • LD	No	For matrix spike analysis on sample MMW-8A-T01N-GRW, the recoveries of fluoride, and nitrite were high, while the recoveries for ammonia, cyanide and PYX were low. Table 1.3 summarizes these matrix spike results and the resultant data qualifications.
Method QC • Surrogates MMW-13-T01N-GRW MMW-8B-T01N-GRW • Serial Dilution MMW-8A-D01N-GRW MMW-8A-T01N-GRW Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate for the explosives analysis was low in two samples. The recovery of surrogate compound 1,2-dinitrobenzene were 84% and 83% in samples MMW-13-T01N-GRW and MMW-8B-T01N-GRW, respectively. These recoveries are outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Therefore, all positive and non-detect results for sample MMW-13-T01N-GRW and MMW-8B-T01N-GRW are qualified as estimated ("J/UJ"). The serial dilution test for sample MMW-8A-D01N-GRW was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 4 of the 24 metals. Of these 4 metals, the percent difference for 2 exceeded the evaluation criteria of ≤ 10%. Table 1.5 summarizes these results and data qualification issued. The serial dilution test for sample MMW-8A-T01N-GRW was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 5 of the 24 metals. Of these 5 metals, the percent difference for 2 exceeded the evaluation criteria of ≤ 10%. Table 1.4 summarizes these results and data qualification issued. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. Recoveries for internal standards Y was high for the ICPMS analysis of samples MMW-34B-T01N-GRW, MMW-34B-D01N-GRW, MMW-36B-T01N-GRW, and MMW-36B-D01N-GRW. However, these samples were diluted and reanalyzed. All molybdenum results were reported from analyses with passing internal standards. Recoveries for internal standard Li was low for the ICPMS analysis of samples MMW-8B-T01N-GRW and MMW-8B-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard.
Field QC • Field Duplicate • Rinsate Blank MMW-8A-RB02T-GRW MMW-8A-RB02D-GRW • Field Blank FB01T-GRW • Trip Blank TB68T-SOL TB74T-SOL TB72T-SOL TB85T-GRW • Other (e.g., splits)	Yes	There were a few detections in the rinsate blanks (RB) associated with groundwater samples. These are summarized in Table 1.5. The RB results for groundwater for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. There were a few detections in the field blanks (FB) associated with groundwater samples. These are summarized in Table 1.6. The FB results for groundwater for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	During the alkalinity analysis performed 11/14/02, the continuing calibration verification sample CCV3 exhibited a percent recovery that exceeded control criteria. Data qualification was not necessary, however, as only the samples with concentrations below the reporting limit were reported from this analysis. These samples are not affected by the potential high bias suggested by the high CCV recovery. As the case narrative noted, the LCS recovery of the explosive compound PYX was low. The recovery was 55%, outside the laboratory's default control limits and outside the QAPP acceptance range of 75-125%. As such, all PYX results were qualified as estimated (J or UJ) with a potential low bias. As noted in the case narrative, the potassium ICV recovery was slightly high at 110.8%. Data qualification was not necessary as none of the samples were analyzed between the ICV and the first calibration verification standard (CCV). As noted in the case narrative, one calibration verification standard had a high recovery for cyanide suggesting a high bias in results. The cyanide recovery for the initial calibration verification standard in the second run was 116%, slightly outside the acceptance range of 85-115%. Data qualification was not necessary because all cyanide results were nondetect, and therefore are not affected by the suggested high bias. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration Some VOC and SVOC initial and continuing calibration criteria were not satisfied. Table 1.7 summarizes initial calibration results not meeting criteria and the resultant data qualification. Table 1.8 summarizes continuing calibration results not meeting validation criteria and the resultant data qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (µg/l)	Nitrite as N (µg/l)	Orthophosphate (µg/l)
MMW-34B-T01N-GRW	2.6 J	0.005 UJ	0.016 J
MMW-36B-T01N-GRW	0.40 UJ	0.005 UJ	0.078 J
MMW-13-T01N-GRW	2.4 J	0.035 J	0.014 J
MW-1-T01N-GRW	1.2 J	0.005 UJ	0.016 J
MMW-35B-T01N-GRW	0.40 UJ	0.0085 J	0.010 UJ
MMW-8A-RB02T-GRW	0.40 UJ	0.005 UJ	0.010 UJ
MMW-8A-T01N-GRW	0.40 UJ	0.005 UJ	0.020 J
MMW-8B-T01N-GRW	3.3 J	0.005 UJ	0.045 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Codes
Aluminum (MS)	---	---	---	---	---	12.08	3.0	MMW-13-T01N-GRW, MMW-13-D01N-GRW, MW-1-T01N-GRW, MW-1-D01N-GRW, MMW-35B-D01N-GRW, MMW-8A-RB02T-GRW, MMW-8A-RB02D-GRW, MMW-8A-T01N-GRW, MMW-8A-D01N-GRW	U MB-I
Antimony (MS)	0.4	0.4	0.6	0.7	---	---	0.20	MMW-34B-T01N-GRW, MMW-36B-T01N-GRW, MMW-36B-D01N-GRW, MMW-35B-T01N-GRW, MMW-35B-D01N-GRW, MMW-8A-D01N-GRW, MMW-8B-T01N-GRW	U CCB-I
Arsenic (MS)	---	0.3	0.7	---	---	---	0.20	MMW-34B-T01N-GRW, MMW-34B-D01N-GRW, MMW-36B-D01N-GRW, MMW-13-T01N-GRW, MMW-13-D01N-GRW, MMW-35B-T01N-GRW, MMW-35B-D01N-GRW, MMW-8A-RB02T-GRW, MMW-8A-RB02D-GRW, MMW-8A-T01N-GRW, MMW-8A-D01N-GRW, MMW-8B-T01N-GRW, MMW-8B-D01N-GRW	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Codes
Copper (MS)	-3.0	-3.0	-3.0	-3.0	---	-1.417	0.30	MMW-13-T01N-GRW, MMW-13-D01N-GRW, MW-1-T01N-GRW, MW-1-D01N-GRW, MMW-35B-T01N-GRW, MMW-35B-D01N-GRW, MMW-8A-RB02T-GRW, MMW-8A-RB02D-GRW, MMW-8A-T01N-GRW, MMW-8A-D01N-GRW, MMW-8B-T01N-GRW, MMW-8B-D01N-GRW	J/UJ CCB-L
Manganese (P)	2	1.9	2.1	---	---	---	2.5	MMW-8B-T01N-GRW, MMW-8B-D01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Qualifications for Metals and Inorganics

Sample/Analytes	MS%R	PDS %R	MSD%R	Criteria	Comment	Action
MMW-8A-T01N-GRW						
Fluoride	160.2	NA	NA	75-125%	NONE	J MS-H parent
Nitrite	130.1	NA	NA		Parent sample is nondetect	No qualification
Ammonia	72.5	NA	NA		NONE	J MS-L parent
Cyanide	48.3	120.8	NA		NONE	UJ MS-L parent
PYX	68	NA	60%	70-130%	NONE	UJ MS-L parent

NA=Not Appropriate

Table 1.4
Serial Dilution Qualifications

Sample/Analyte	%Difference	Action
MMW-8A-T01N-GRW • Na • Mo	 10.7% 15.7%	The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.
MMW-8A-D01N-GRW • Na • Mo	 10.4% 13.8%	The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.

Table 1.5
Positive Results for Rinsate Blanks

Analyte	MMW-8A-RB02T-GRW	MMW-8A-RB02D-GRW	RL
Ammonia (mg/L)	0.23	NA	0.040
Bicarbonate Alkalinity (mg/L)	1.0	NA	1.0
Total Alkalinity (mg/L)	1.0	NA	1.0
Total Dissolved Solids (mg/L)	8.0	NA	5.0
Chloroform (µg/l)	6	NA	10
Bis (2-Ethlhexyl)phthalate (µg/l)	0.9	NA	10

Table 1.6
Positive Results for Field Blanks

Analyte	MMW-8A-RB02T-GRW	MMW-8A-RB02D-GRW	RL
Chloroform (µg/l)	6	NA	10
Bis (2-Ethlhexyl)phthalate (µg/l)	6	NA	10

Table 1.7
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC ICAL Date/Time	Analyte	|%RSD| >30%	Samples	Qualification and Qualification Codes
11/12/03 (0846)	Benzaldehyde	33.6%	MMW-34B-T01N-GRW, MMW-36B-T01N-GRW, MMW-35B-T01N-GRW, FB01T-GRW, MMW-8A-RB02T-GRW, MMW-8A-T01N-GRW, MMW-8B-T01N-GRW	UJ ICAL-I

Table 1.8
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Samples	Qualification and Qualification Codes
11/06/02 (2100)	Bromomethane Acetone 2-Butanone 4-Methyl-2-pentanone 2-Hexanone	-27.8% 50.8% 50.7% 30.1% 48.2%	TB68T-SOL, MMW-34B-T01N-GRW	UJ/J CCAL-I
11/07/02 (0740)	Bromomethane Acetone 2-Butanone 4-Methyl-2-pentanone 2-Hexanone	-25.7% 51.6% 51.0% 34.8% 51.0%	MMW-36B-T01N-GRW, TB74T-SOL, MMW-35B-T01N-GRW, TB72T-GRW, FB01T-GRW, MMW-8A-RB02T-GRW, MMW-8A-T01N-GRW, MMW-8B-T01N-GRW, TB85T-GRW	UJ/J CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Samples**	**Qualification and Qualification Codes**
11/13/03 (0642)	2,2'-oxybis (1-Chloropropane)	-27.4%	MMW-34B-T01N-GRW, MMW-36B-T01N-GRW	UJ CCAL-I
11/14/02 (0533)	Benzaldehyde 2,2'-oxybis (1-Chloropropane)	32.6% -27.8%	MMW-35B-T01N-GRW, FB01T-GRW, MMW-8A-RB02T-GRW, MMW-8A-T01N-GRW	UJ CCAL-I
11/15/02 (0624)	Benzaldehyde 4,6-Dinitro-2-methylphenol	38.7% -25.4%`	MMW-8B-T01N-GRW	UJ CCAL-I

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT018 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Brice Woodlock Date Completed: 01/20/03

Peer Reviewer: Alan Roberts Date Completed: 01/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
MMW-19A-T01N-GRW	SA	508945		W	X	X			X		
MMW-19A-T01D-GRW	FD	508946		W	X	X			X		
MMW-19A-D01N-GRW	SA	508947		W	X						
MMW-19A-D01D-GRW	FD	508948		W	X						
MMW-25B-T01N-GRW	SA	508949		W	X	X			X		
MMW-25B-D01N-GRW	SA	508950		W	X						
MMW-8B-T01D-GRW	FD	508951		W	X	X	X	X	X		
MMW-8B-D01D-GRW	FD	508952		W	X						
TB71T-GRW	TB	508953		W			X				
MMW-43A-T01N-GRW	SA	508954		W	X	X	X	X			
MMW-43A-D01N-GRW	SA	508955		W	X						
COLCGWELL-T01N-GRW	SA	508956		W	X	X			X		
COLCGWELL-D01N-GRW	SA	508957		W	X						
MMW-31A-T01N-GRW	SA	508958		W	X	X			X		
MMW-31A-D01N-GRW	SA	508959		W	X						
MMW-31A-T01D-GRW	FD	508960		W	X	X			X		
MMW-31A-D01D-GRW	FD	508961		W	X						
MMW-24-T01N-GRW	SA	508962		W	X	X			X		
MMW-24-D01N-GRW	SA	508963		W	X						
MMW-29B-T01N-GRW	SA	508964		W	X	X			X		
MMW-29B-D01N-GRW	SA	508965		W	X						

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

Samples COLUMBINE CG WELL-T01N-GRW and COLUMBINE CG WELL-D01N-GRW were abbreviated to COLCGWELL-T01N-GRW and COLCGWELL-T01N-GRW, respectively, by the laboratory to accommodate field length limitations in processing the data summary forms.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as nitrate as NO_3. These raw results have been converted to final results expressed as nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of nitrogen to the molecular weight of nitrate.

A volatile holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank has been included in the data package and is labeled as HBW018. The analysis of this blank yielded a percent recovery of the surrogate monitoring compound 1,2-dichloroethane-d4 that marginally exceeded control criteria. No target analytes were detected in this sample, therefore no qualification of the associated data was considered necessary.

The matrix spike samples of the explosive compound PYX were outside the default control limits. At this time, the laboratory has not established acceptance ranges for this compound from control charts. The resultant data qualification is described in the table below.

The blank spike samples of the explosive compound PYX were outside the default control limits. At this time, the laboratory has not established acceptance ranges for this compound from control charts. The blank spike sample (58%) was below acceptance range (70-130%). All associated PYX results were non-detect and were qualified UJ for this low bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample names, MMW-25-T01N-GRW and MMW-25-D01N-GRW from the COC forms, were corrected by the laboratory to MMW-25B-T01N-GRW and MMW-25B-D01N-GRW. The laboratory indicated there was a lack of adequate preservative in samples MMW-19A-T01N-GRW, MMW-19A-T01D-GRW, MMW-31A-T01N-GRW and MMW-31A-T01D-GRW which resulted in a possible loss of cyanide, therefore cyanide results for these samples are estimated "J" for positive results and "UJ" for non-detects. The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, and Orthophosphate were not met for some samples. Table 1.1 summarizes the holding time exceedances and the resultant data qualifications. Results for hold time exceedances reflect an indeterminate bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Laboratory Blank Results	No	Antimony, copper, manganese, molybdenum and nickel were detected in various blanks. Table 1.2 summarizes the blank detentions and the resultant data qualifications. Reported values <5x the blank detection becomes the "effective" RL. An indeterminate bias direction was assigned. Trace amounts of compounds 1,2-dibromo-3-chloropropane and 1,2,4-trichlorobenzene were detected in the VOC method blanks VBLKA1 and VBLKC7. The sample results for these compounds were all non-detect and therefore required no qualification of the data based on blanks. A trace amount of compounds diethylphthalate, di-n-butyl phthalate, and bis(2-ethyl hexyl) phthalate were detected in the SVOC method blank SBLKZ7. Only bis(2-ethyl hexyl) phthalate was detected in the one associated sample, MW-43A-T01N-GRW. This compound result for this sample was qualified as non-detect at the RL.
Matrix QC • MS/MSD/PDS MMW-31A-T01N-GRW MMW-31A-D01N-GRW • LD MMW-31A-T01N-GRW MMW-31A-D01N-GRW	No	For matrix spike analysis on sample MMW-31A-T01N-GRW, the recoveries of bicarbonate alkalinity, total alkalinity, TKN, cyanide and PYX were low. Table 1.3 summarizes these matrix spike results and the resultant data qualifications. The matrix spike results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For post digestion spike analysis on sample MMW-31A-T01N-GRW the recoveries of cyanide was outside acceptance criteria. Table 1.3 summarizes these post digestion spike results. The post digestion spike results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For laboratory duplicate analysis of samples MMW-31A-T01N-GRW, the total suspended solids and sulfate results did not meet acceptance criteria. Table 1.4 summarizes these results and the resultant data qualifications. The laboratory duplicate results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC Surrogates Serial Dilution MMW-31A-T01N-GRW MMW-31A-D01N-GRW Internal Standards Total vs. Partial Analyses Cation/Anion Balance	No	The surrogate for the explosives analyses, 1,2-dinitrobenzene, was low in one sample. The recovery for sample MMW-19A-T01N-GRW was 82%. This is below the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. All results for this sample were non-detect and therefore were qualified as estimated ("UJ") with a low bias. The surrogate for the explosives analyses, 1,2-dinitrobenzene, was high in one sample. The recovery was 120%, above the acceptance range of 85%-116%, suggesting a potential high bias in the associated sample results. All results were non-detect for this sample MMW-29B-T01N-GRW and therefore, no qualification of data was necessary based on this surrogate recovery. The serial dilution test for sample MMW-31A-D01N-GRWL was applicable for only 13 of the 24 metals. Table 1.5 summarizes these results and data qualification issued. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any additional data qualification issued will be summarized in the overall assessment. Recoveries for internal standards Y and Tb were high for the ICPMS analysis of numerous samples. However, these samples were either analyzed by Trace ICP or diluted and reanalyzed. All results were reported from analyses with passing internal standards. For samples MMW-19A-T01N/D01N-GRW, MMW-19A-T01D/D01D-GRW, MMW-31A-T01N/D01N-GRW, MMW-31A-T01D/D01D-GRW and MMW-24-T01N/D01N-GRW the absolute value of the percent difference between the anion/cation balance was -54.52%, -90.39%, -32.91%, -81.85% and –79.79% respectively, outside the acceptance range of ±13%. The pH of samples MMW-19A-T01N/D01N-GRW, MMW-19A-T01D/D01D-GRW, MMW-31A-T01N/D01N-GRW, MMW-31A-T01D/D01D-GRW and MMW-24-T01N/D01N-GRW were 4.13, 4.13, 4.21, 4.21 and 4.58 respectively. Evaluations of the results relative to TDS, specific conductivity, and speciation of the sulfate ion at low pH indicates that the sample analyses were likely biased high. Therefore the sulfate result for these samples were qualified as J TvP-H.
Field QC • Field Duplicate (FD) MMW-19A-T01D-GRW MMW-19A-D01D-GRW MMW-8B-T01D-GRW (in WAT017) MMW-8B-D01D-GRW (in WAT017) MMW-31A-T01D-GRW MMW-31A-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) TB71T-GRW TB85T-GRW • Others (e.g., splits)	No	This package included field duplicate (FD) samples that were slightly outside the control criteria as summarized in Table 1.6. The field quality control results for the August 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value
Package Completeness	No	The analytical package was evaluated for completeness and it was noted in the inorganics that phosphorus was accidentally written as phosphate. The phosphate line was crossed out and correctly revised by hand on the original form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration Some VOC and SVOC initial and continuing calibration criteria were not satisfied. Table 1.7 summarizes initial calibration results not meeting criteria and the resultant data qualification. Table 1.8 summarizes continuing calibration results not meeting validation criteria and the resultant data qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications

Sample	Nitrate as N	Nitrite as N	Orthophosphate
MMW-19A-T01N-GRW	5.2 J	0.005 UJ	0.051 J
MMW-19A-T01D-GRW	5.9 J	0.005 UJ	0.051 J
MMW-25B-T01N-GRW	0.040 UJ	0.005 UJ	0.010 UJ
MMW-8B-T01N-GRW	2.9 J	0.005 UJ	0.036 J
COLCGWELL-T01N-GRW	0.040 UJ	0.005 UJ	0.010 UJ
MMW-31A-T01N-GRW	5.2 J	0.005 UJ	0.017 J
MMW-31A-T01D-GRW	4.5 J	0.005 UJ	0.017 J
MMW-24-T01N-GRW	74.3 J	0.005 UJ	0.010 UJ
MMW-29B-T01N-GRW	0.040 UJ	0.005 UJ	0.013 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	MB (µg/l)	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	RL	Samples Qualified	Qualification Codes
Copper (MS)	1.548	---	---	---	---	---	0.60	MMW-25B-D01N-GRW, MMW-8B-T01D-GRW, MMW-8B-D01D-GRW, MMW-43A-T01N-GRW, MMW-43A-D01N-GRW, COLCGWELL-T01N-GRW, COLCGWELL-D01N-GRW, MMW-29B-T01N-GRW	U MB-I
Nickel (MS)	0.439	---	---	---	---	---	0.40	MMW-43A-D01N-GRW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results for Metals and Inorganics

	Matrix Spike Recovery	Matrix Spike Recovery Duplicate	Post Digestion Spike Recovery	Acceptance Limit	Action
MMW-31A-T01N-GRW					
Bicarbonate Alkalinity	5.8%	---	---	75-125%	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery. No qualification was necessary.
Total Alkalinity	5.8%	---	---		
TKN	65%	---	---		Qualify parent sample UJ MS-L
Cyanide	0.4%	---	126.5%		Qualify parent sample R MS, PDS-I
PYX	45%	35%	---	70-130%	Qualify parent sample UJ MS-L

Table 1.4
Duplicate Qualifications

Sample/Analyte	Absolute Difference or RPD (%)	1xRL	Action
MMW-31A-T01N-GRW • TSS • Sulfate	5xRL 59%	0.5	The laboratory duplicate results for water and biota for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Table 1.5
Serial Dilution Qualifications

Sample Analyte	%Difference	Action
MMW-31A-T01N-GRW • Aluminum • Beryllium • Cadmium • Calcium • Cobalt • Copper • Magnesium	 13.6% 14.6% 24.1% 15.2% 16.3% 10.2% 11.1%	The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.
MMW-31A-D01N-GRW • Aluminum • Beryllium • Cadmium • Calcium • Cobalt • Copper • Lead • Magnesium	14.8% 17.1% 17.5% 16.5% 19.5% 10.8% 11.8% 12.6%	The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.

Table 1.6
Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	MMW-8B-T01N-GRW	MMW-8B-T01D-GRW	Criteria Comment	Outside Criteria	RL	Action
Bicarbonate Alkalinity (mg/l)	23.3	14.2	RPD<30%	RPD=48.5%	1.0	J FD-L parent
Total Alkalinity (mg/l)	23.3	14.2	RPD<30%	RPD=48.5%	1.0	J FD-L parent
Ammonia (mg/l)	0.35	0.15	Abs. Diff. <2xRL (0.08)	Abs Diff.=0.2	0.04	J FD-L parent
Analyte	**MMW-19A-T01N-GRW**	**MMW-19A-T01D-GRW**	**Criteria Comment**	**Outside Criteria**	**RL**	**Action**
Sulfate (mg/l)	5100	34300	RPD<30%	RPD=148%	1000	J FD-H parent
Ammonia (mg/l)	0.28	0.16	Abs. Diff. <2xRL (0.08)	Abs Diff.=0.12	0.04	J FD-L parent
Cadmium (µg/l)	0.1	63.7	RPD<30%	RPD=43.6%	0.1	J FD-H parent
Analyte	**MMW-31A-T01N-GRW**	**MMW-31A-T01D-GRW**	**Criteria Comment**	**Outside Criteria**	**RL**	**Action**
TSS (mg/l)	3.7	1.1	Abs. Diff. <2xRL (1.0)	Abs Diff.=2.6	0.5	J FD-L parent
Sulfate (mg/l)	3080	15300	RPD<30%	RPD=133%	400	J FD-H parent
Ammonia (mg/l)	0.24	0.15	Abs. Diff. <2xRL (0.08)	Abs Diff.=0.09	0.04	J FD-L parent

Table 1.7
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC ICAL Date/Time	Analyte	|%RSD| >30%	Samples	Qualification and Qualification Codes
11/12/03 (0846)	Benzaldehyde	33.6%	MMW-34B-T01N-GRW, MMW-36B-T01N-GRW, MMW-35B-T01N-GRW, FB01T-GRW, MMW-8A-RB02T-GRW, MMW-8A-T01N-GRW, MMW-8B-T01N-GRW	UJ ICAL-I

Table 1.8
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Sample	Qualification and Qualification Codes
11/07/02 (0740)	Bromomethane Acetone 2-Butanone 4-Methyl-2-Pentanone 2-Hexanone 1,2-Dibromo-3-chloropropane	-25.7% 51.6% 51.0% 34.8% 51.0% 27.2%	MMW-8B-T01D-GRW, TB71T-GRW, MMW-43A-T01N-GRW	UJ/J CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Sample**	**Qualification and Qualification Codes**
11/14/02 (0533)	Benzaldehyde 2,2'-oxybis (1-Chloropropane)	32.6% -27.8%	MMW-35B-T01N-GRW, FB01T-GRW, MMW-8A-RB02T-GRW, MMW-8A-T01N-GRW	UJ CCAL-I

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT019 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: B. Woodlock /A. Roberts Date Completed: 01/22/03

Peer Reviewer: Alan Roberts Date Completed: 01/22/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
MMW-32A-T01N-GRW	SA	508991	2AT01NGRW	W	X	X			X		
MMW-32A-D01N-GRW	SA	508992		W	X						
MMW-29A-T01N-GRW	SA	508993	MW29AT01NGRW	W	X	X			X		
MMW-29A-D01N-GRW	SA	508994		W	X						
MMW-30A-T01N-GRW	SA	508995	MW30AT01NGRW	W	X	X					
MMW-30A-D01N-GRW	SA	508996		W	X						
MMW-30B-T01N-GRW	SA	508997	MW30BT01NGRW	W	X	X					
MMW-30B-D01N-GRW	SA	508998		W	X						
MMW-10C-T01N-GRW	SA	509110	MW10CT01NGRW	W	X	X			X		
MMW-10C-D01N-GRW	SA	509111		W	X						
P-3-T01N-GRW	SA	509112		W	X	X			X		
P-3-D01N-GRW	SA	509113		W	X						
MMW-11-T01N-GRW	SA	509114	11T01NGRW	W	X	X			X		
MMW-11-D01N-GRW	SA	509115		W	X						
MMW-18B-T01N-GRW	SA	509116	MW18BT01NGRW	W	X	X			X		
MMW-18B-D01N-GRW	SA	509117		W	X						
MMW-11A-T01N-GRW	SA	509118	MW11AT01NGRW	W	X	X			X		
MMW-11A-D01N-GRW	SA	509119		W	X						
MMW-11A-T01D-GRW	FD	509120	MW11AT01DGRW	W	X	X			X		
MMW-11A-D01D-GRW	FD	509121		W	X						
FB02T-GRW	FB	509122		W					X		
RB03T-GRW	RB	509123		W	X	X			X		

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank FB = Field Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] All field ID abbreviations were made in the explosives analyses only.

* Non DP-1055 compliance sample

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as nitrate as NO_3. These raw results have been converted to final results expressed as nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of nitrogen to the molecular weight of nitrate.

During the alkalinity analysis of the samples in this delivery group, the associated continuing calibration check standards yielded percent recoveries that exceeded control criteria. However, the analysis of the associated samples yielded all non-detect results. Therefore no qualification was considered necessary, and therefore the samples were reported from this analysis.

The cyanide analysis of the initial calibration check standard associated with samples MMW-32A-T01N-GRW yielded percent recoveries for cyanide that was slightly above control criteria. The cyanide result for this sample was non-detect so no qualification was considered necessary.

The nitroaromatics analysis of the blank spike samples associated with this delivery group yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded recoveries (60% and 62%) below the default control limits (70-130%). The laboratory has not yet established control charted control limits for this compound. The PYX result for all associated samples were qualified as estimated.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample IDs, MMW-29-T01N-GRW and MMW-29-D01N-GRW from the COC forms, were corrected by the laboratory to MMW-29A-T01N-GRW and MMW-29A-D01N-GRW. The laboratory indicated there was a lack of adequate preservative in samples MMW-11-T01N-GRW, MMW-11A-T01N-GRW and MMW-11A-T01D-GRW which resulted in a possible loss of cyanide, therefore cyanide results for these samples are estimated "J" for positive results and "UJ" for non-detects. The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, and Orthophosphate and the 28-day hold time for Total Kjeldahl Nitrogen were not met for some samples. Table 1.1 summarizes the holding time exceedances and the resultant data qualifications. Results for hold time exceedances reflect an indeterminate bias.
Laboratory Blank Results	No	Boron, iron, manganese molybdenum, antimony, copper, lead, nickel and selenium were detected in various blanks. Table 1.2 summarizes the blank detentions and the resultant data qualifications. Reported values <5x the blank detection becomes the "effective" RL. An indeterminate bias direction was assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD/PDS MMW-32A-T01N-GRW MMW-32A-D01N-GRW MMW-11-T01N-GRW MMW-11-D01N-GRW • LD MMW-32A-T01N-GRW MMW-32A-D01N-GRW MMW-11-T01N-GRW MMW-11-D01N-GRW	No	For matrix spike analysis on sample MMW-32A-T01N-GRW, the recoveries of bicarbonate alkalinity, total alkalinity, antimony, beryllium, cyanide, and PYX were low, and the recovery for sulfate was high. For matrix spike analysis on sample MMW-32A-D01N-GRW, the recoveries of beryllium, nickel and cobalt were low. For matrix spike analysis on sample MMW-11-T01N-GRW, the recoveries of total kjeldahl nitrogen and cyanide were low. For matrix spike analysis on sample MMW-11-D01N-GRW, the recovery of copper was low. Table 1.3 summarizes these matrix spike results. The matrix spike results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment For post digestion spike analysis on sample MMW-32A-T01N-GRW the recoveries of beryllium, nickel and cyanide were low. Similarly, for sample MMW-11-D01N-GRW, the recovery of copper was low. Table 1.3 summarizes these post digestion spike results. The post digestion spike results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For laboratory duplicate analysis of sample MMW-31A-T01N-GRW, the sulfate results did not meet acceptance criteria. For laboratory duplicate analysis of sample MMW-11-T01N-GRW, the bicarbonate alkalinity, total alkalinity and ammonia as N results did not meet acceptance criteria. For laboratory duplicate analysis of sample MMW-11-D01N-GRW, the iron results did not meet acceptance criteria. Table 1.4 summarizes these results. The laboratory duplicate results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-32A-T01N-GRW MMW-32A-D01N-GRW MMW-11-T01N-GRW MMW-11-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate for the explosives analyses, 1,2-dinitrobenzene, was low in one sample. The recovery for sample MMW-30A-T01N-GRW was 83%. This is below the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. All results for this sample were non-detect and therefore were qualified as estimated ("UJ") with a low bias. The surrogate for the explosives analyses, 1,2-dinitrobenzene, was high in the analysis on both columns in MMW-30B-T01N-GRW. The recoveries were 275% and 395%, above the acceptance range of 85%-116%, suggesting a potential high bias in the associated sample results. The compounds RDX and 2,4,6-trinitrotoluene were detected and qualified as estimated ("J") with a high bias. All remaining results were non-detect for this sample and therefore, no qualification of these data was considered necessary based on this surrogate recovery. The serial dilution test for sample MMW-32A-T01N-GRWL was applicable for 10 of the 24 metals. Of these 10 metals, the percent difference for 9 exceeded the evaluation criteria of ≤ 10%. The serial dilution test for sample MMW-32A-D01N-GRW was applicable for 9 of the 24 metals. Of these 9 metals, the percent difference for 9 exceeded the evaluation criteria of ≤ 10%. The serial dilution test for sample MMW-11-T01N-GRWL was for only 10 of the 24 metals. For each of these 10 metals, the % difference between the original and five-fold diluted results was ≤ 10%. As such, data qualification was not necessary. The serial dilution test for sample MMW-11-D01N-GRWL was for 10 of the 24 metals. Of these 10 metals, the percent difference for 9 exceeded the evaluation criteria of ≤ 10%. Table 1.5 summarizes these results and data qualification issued. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any additional data qualification issued will be summarized in the overall assessment. Recoveries for internal standards Y, Li, Sc, Bi and Tb were high for the ICPMS analysis of numerous samples. However, these samples were either

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		analyzed by Trace ICP or diluted and reanalyzed. All results were reported from analyses with passing internal standards. For samples MMW-32A-T01N/D01N-GRW, P-3-T01D/D01D-GRW, MMW-11A-T01N/D01N-GRW and MMW-11A-T01D/D01D-GRW the absolute value of the percent difference between the anion/cation balance was –60.69%, -31.43%, -32.88% and –32.58% respectively, outside the acceptance range of ±13%. The pH of samples MMW-32A-T01N/D01N-GRW, P-3-T01D/D01D-GRW, MMW-11A-T01N/D01N-GRW and MMW-11A-T01D/D01D-GRW were 4.28, 4.71, 4.17 and 4.17 respectively. Evaluations of the results relative to TDS, specific conductivity, and speciation of the sulfate ion at low pH indicates that the sulfate analyses were likely biased high. Therefore the sulfate result for these samples were qualified as J TvP-H. The orthophosphate and phosphorus results were qualified as estimated (J/UJ TVP-I) because the orthophosphate result was greater than the phosphorus result.
Field QC • Field Duplicate MMW-11A-T01D-GRW MMW-11A-D01D-GRW • Rinsate Blank RB03T-GRW • Field Blank FB02T-GRW • Trip Blank (TB) • Others (e.g., splits)	No	This package included field duplicate (FD) samples that were slightly outside the control criteria as summarized in Table 1.6. Also, there was one detection in the field quality control blanks (RB). It is summarized in Table 1.7. The field quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value
Package Completeness	No	The analytical package was evaluated for completeness and it was noted in the inorganics that phosphorus was accidentally written as phosphate. The phosphate line was crossed out and correctly revised by hand on the original form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications

Sample	TKN (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)
MMW-32A-T01N-GRW	0.24 UJ		0.005 UJ	0.017 J
MMW-29A-T01D-GRW	0.24 UJ	4.4 J	0.005 UJ	0.016 J
MMW-30A-T01N-GRW	0.24 UJ	3.1 J	0.005 UJ	0.010 UJ
MMW-30B-T01N-GRW	0.48 J	0.040 UJ	0.012 J	0.50 J
MMW-10C -T01N-GRW			0.005 UJ	0.010 UJ
P-3-T01N-GRW			0.005 UJ	0.010 UJ
MMW-11-T01N-GRW		5.1 J	0.005 UJ	0.024 J
MMW-18B-T01N-GRW		0.75 J	0.005 UJ	0.026 J
MMW-11A-T01N-GRW		5.5 J	0.005 UJ	0.044 J
MMW-11A-T01D-GRW		5.3 J	0.005 UJ	0.043 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	MB (µg/l)	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	RL	Samples Qualified	Qualification Codes
Boron (P)	---	5.1	---	---	---	---	4.8	MMW-32A-T01N-GRW MMW-32A-D01N-GRW	U CCB-I
Iron (P)	---	---	---	---	---	23.8	22.6	MMW-18B-D01N-GRW MMW-11A-T01N-GRW MMW-11A-D01N-GRW MMW-11A-D01D-GRW	U CCB-I
Copper (MS)	0.926	---	---	---	1.7	---	0.3	MMW-30B-T01N-GRW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Recovery Not Meeting Criteria

Sample/Analytes	Matrix Spike Recovery	Matrix Spike Duplicate Recovery	Post Digestion Spike Recovery	Acceptance Limits	Action
MMW-32A-T01N-GRW					
Bicarbonate Alkalinity	6.0%	---	---	75-125%	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery. No qualification was necessary.
Total Alkalinity	6.0%	---	---		
Sulfate	134%	---	---		Qualify parent sample UJ MS-H
Cyanide	2.0%	---	61.6%		Qualify parent sample R MS, PDS-L
Antimony	72.5%	---	---		Qualify parent sample J MS-L
Beryllium	74.0%	---	74.4%		Qualify parent sample UJ MS, PDS-L
Nickel	74.3%	---	73.9%		Qualify parent sample UJ MS, PDS-L
Cobalt	74.2%	---	---		Qualify parent sample UJ MS-L
PYX	30%	35%	---	70-130%	Qualify parent sample UJ MS-L

Sample/Analytes	Matrix Spike Recovery	Matrix Spike Duplicate Recovery	Post Digestion Spike Recovery	Acceptance Limits	Action
MMW-32A-D01N-GRW					
Beryllium	73.1%	---	---	75-125%	Qualify parent sample UJ MS-L
MMW-11-T01N-GRW					
TKN	55%	---	---		Qualify parent sample UJ MS-L
Cyanide	34.5%	---	---		Qualify parent sample UJ MS-L
PYX	100		---		?
MMW-11-D01N-GRW					
Copper	72.9%	---	72.5%		Qualify parent sample UJ MS, PDS-L

Table 1.4
Laboratory Duplicate Recovery Not Meeting Criteria

Sample/Analyte	Absolute difference or RPD (%)	1xRL	Action
MMW-32A-T01N-GRW • Sulfate **MMW-11-T01N-GRW** • Bicarbonate Alkalinity • Total Alkalinity **MMW-11-D01N-GRW** • Iron	45% 22% 22% 1.04xRL	22.6	The laboratory duplicate results for water and biota for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Table 1.5
Serial Dilution Qualifications

Sample Analyte	%Difference	Action
MW-32A-T01N-GRW		The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.
• Aluminum	20.9%	
• Beryllium	24.0%	
• Cadmium	23.2%	
• Calcium	21.5%	
• Cobalt	22.9%	
• Copper	17.1%	
• Magnesium	17.7%	
• Manganese	20.4%	
• Zinc	24.0%	
MMW-32A-D01N-GRW		The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.
• Aluminum	-21.6%	
• Beryllium	-24.0%	
• Cadmium	-24.2%	
• Calcium	-21.7%	
• Cobalt	-24.6%	
• Copper	-17.9%	
• Magnesium	-18.6%	
• Manganese	-13.1%	
• Zinc	-17.0%	
MMW-11-D01N-GRW		The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.
• Aluminum	19.0%	
• Beryllium	23.9%	
• Cadmium	23.0%	
• Calcium	19.6%	
• Copper	21.0%	
• Magnesium	17.1%	
• Manganese	17.8%	
• Zinc	21.5%	

Table 1.6
Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	MMW-11A-T01N-GRW	MMW-11A-T01D-GRW	Criteria Comment	Outside Criteria	RL	Action
Cadmium (µg/l)	10.9	40.4	RPD<30%	RPD=115%	0.3	J FD-H parent
Iron (µg/l)	202	22.6	Abs. Diff. <2xRL (45.2)	Abs Diff.=179.4	22.6	UJ/J FD-L parent

Table 1.7
Positive Results for Rinsate Blanks

Analyte	RB03T-GRW (µg/l)
TSS	0.50
Fluoride	0.12
Aluminum	6.4
Manganese	9.7
Zinc	8.5

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT020 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Laboratory Review: Karen Kronoveter Data Completed: 05/21/03

Data Validation Review: Ansley Watson Date Completed: 1/17/03

Peer Reviewer: Alan Roberts Date Completed: 1/20/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Inorganics	Metals	VOCs	SVOCs	Explosives	Pesticides	PCBs
MMW-10A-T01N-GRW	SA	509165	MW10AT01NGRW	W	X	X			X		
MMW-10A-D01N-GRW	SA	509166		W		X					
MMW-10B-T01N-GRW	SA	509167	MW10BT01NGRW	W	X	X			X		
MMW-10B-D01N-GRW	SA	509168		W		X					
MMW-17A-T01N-GRW	SA	509169	7AT01NGRW	W	X	X			X		
MMW-17A-D01N-GRW	SA	509170		W		X					
P-2-T01N-GRW	SA	509243	P2T01NGRW	W	X	X	X	X	X		
P-2-D01N-GRW	SA	509244		W		X					
MMW-21-T01N-GRW	SA	509245	MMW21T01NGRW	W	X	X	X	X	X		
MMW-21-D01N-GRW	SA	509246		W		X					
MMW-7-T01N-GRW	SA	509247	MMW7T01NGRW or MMW7T01N-GRW	W	X	X	X	X	X		
MMW-7-D01N-GRW	SA	509248		W		X					
MMW-28A-T01N-GRW	SA	509249	MMW28AT01NGRW	W	X	X	X	X			
MMW-28A-D01N-GRW	SA	509250		W		X					
MMW-28B-T01N-GRW	SA	509251	MMW28BT01NGRW	W	X	X	X	X			
MMW-28B-D01N-GRW	SA	509252		W		X					
MMW-7-T01D-GRW	FD	509253	MMW7T01DGRW or MMW7T01N-GRW	W	X	X	X	X	X		
MMW-7-D01D-GRW	FD	509254		W		X					
MMW-22-T01N-GRW	SA	509255	MMW22T01NGRW	W	X	X	X	X	X		
MMW-22-D01N-GRW	SA	509256		W		X					

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC sample is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, they are identified under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria. °C

Case Narrative Summary: The following issues were noted in the case narrative.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3. These raw results have been converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. The laboratory has issued replacement data sheets that have been collated in with the original data sets. The original nitrate data sheets for the affected packages have been marked as superseded.

The original sulfate analyses for sample MMW-21-T01N-GRW, and MMW-7-T01D-GRW and MMW-22-T01N-GRW were performed within the prescribed holding time. However, during the data validation process it was discovered that these samples required additional dilution analyses, which were performed 19 days outside of the prescribed holding time. The results from these dilution analyses have been formally presented in this case submittal. Table 1.1 below summarizes the qualification for hold time in sulfate.

The original Total Dissolved Solids (TDS) analysis of sample MMW-21-T01N-GRW, MMW-7-T01N-GRW, MMW-7-T01D-GRW, and MMW-22-T01N-GRW which was performed within holding time, yielded a net weight after drying that greatly exceeded the upper limit of the method. This sample was re-analyzed using a smaller sample volume outside of holding time yielding results comparable to the original analyses. The results from the re-analyses have been formally reported in the case submittal. Table 1.1 below summarizes the qualification for hold time in TDS.

Molybdenum was reported from a trace ICP analysis for the samples in this SDG due to the presence of interference that resulted in the failure of the associated internal standard during the ICP/MS analysis. The failure of this internal standard also appears to affect the Selenium results obtained. For this reason Selenium has been reported from the trace ICP analysis as well. No qualification in the associated data was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample MMW-28B-T01N-GRW accidentally had explosives requested instead of SVOCs for analysis on the COC. The laboratory was contacted and the correct analysis was performed. The laboratory indicated that there was a lack of adequate preservative in samples MMW-10A-T01N-GRW, MMW-21-T01N-GRW, MMW-22-T01N-GRW, MMW-7-T01N-GRW, MMW-7-T01D-GRW, and MMW-28B-T01N0GRW, which resulted in a possible loss of cyanide, therefore cyanide results for these samples are estimated "J" for positive results and "UJ" for nondetects. The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, Orthophosphate, BOD, 7 day hold time for TDS, and 28 day hold time for Sulfate were not met for some samples. Table 1.1 summarizes the holding time exceedances and the resultant data qualifications. Results for hold time exceedance reflect an indeterminate bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Laboratory Blank Results	No	Antimony, beryllium, iron, lead, manganese, selenium, 1,2-dibromo-3-chloropropane, 1,2, 4-trichlorobenzene, diethlphthalate, carbzole, and bis-(2-ethlyhexyl)phthalate were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned. In the negative results with potential low bias, concentrations that produce more than 25% effect on a reported sample or sample reporting limit were qualified as estimated ("J/UJ").
Matrix QC • MS/MSD/PDS MMW-17A-T01N-GRW MMW-17A-D01N-GRW P-2-T01N-GRW P-2-D01N-GRW • LD MMW-17A-T01N-GRW MMW-17A-D01N-GRW P-2-T01N-GRW P-2-D01N-GRW	No	The matrix spike analyses in samples MMW-17A-T01N-SFW, MMW-17A-D01N-GRW, P-2-T01N-GRW, and P-2-D01N-GRW yielded low recoveries for fluoride, ammonia, bicarbonate alkalinity, total alkalinity, arsenic, cyanide, zinc, and PYX. Table 1.3 summarizes these matrix spike results allow with qualifications, if considered necessary, for the parent samples. The matrix spike results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment For post digestion spike analysis on sample P-2-D01N-GRW, the recovery of arsenic was low. Similarly, for sample MMW-17A-T01N-GRW, the recovery of cyanide was high. Table 1.3 summarizes these post digestion spike results. The post digestion spike results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment For laboratory duplicate analysis of samples MMW-17A-T01N-GRW and P-2-T01N-GRW, the nitrate, sulfate, bicarbonate alkalinity, total alkalinity, and ammonia results did not meet acceptance criteria. Table 1.4 summarizes these results. The laboratory duplicate results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment
Method QC • Surrogates • Serial Dilution P-2-D01N-GRW P-2-T01N-GRW MMW-17A-D01N-GRW MMW-17A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate for the explosives analysis was high in sample MMW-7-T01N-GRW, and MMW-7-T01D-GRW. The recoveries of surrogate compound 1,2-dinitrobenzene were 118% and 120% respectively. These recoveries are outside the acceptance range of 85%-116%, suggesting a potential high bias in the associated sample results. All sample results were non-detect; therefore no qualification was required. Recoveries for internal standard Y was high for the ICPMS analysis of all the samples in this SDG. Therefore, these samples were analyzed by Trace ICP. The serial dilution test for sample P-2-D01N-GRWL was applicable for 8 of the 24 metals. Of these 8 metals, the percent difference for 8 exceeded the evaluation criteria of ≤ 10%. The serial dilution test for sample P-2-T01N-GRWL was for 8 of the 24 metals. Of these 8 metals, the percent difference for 2 exceeded the evaluation criteria of ≤ 10%. The serial dilution test for sample MMW-17A-D01N-GRWL was applicable for 7 of the 24 metals. For each of these 7 metals, the % difference between the original and five-fold diluted results was ≤ 10%. As such, data qualification was not necessary. The serial dilution test for sample MMW-17A-T01N-GRWL was applicable for 5 of the 24 metals. Of these 5 metals, the percent difference for 1 exceeded the evaluation criteria of ≤ 10%. Table 1.7 summarizes these results and data qualification issued. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. For samples MMW-10A-T01ND01N-GRW, MMW-10B-T01ND01N-GRW, MMW-17A-T01N/D01N-GRW, P-2-T01N/D01N-GRW, MMW-21-T01N/D01N-GRW, MMW-7-T01N/D01N-GRW, MMW-28A-T01N/D01N-GRW, MMW-28B-T01N/D01N-GRW, MMW-7-T01D/D01D-GRW, and MMW-22-T01N/D01N-GRW the absolute value of the percent difference and (pH) between the anion/cation balance was -47.74 (4.18), -27.52% (6.0), -16.86 (4.56), -39.43 (4.34), -16.11 (3.32), -23.89 (4.2), -22.32 (5.88), -23.87 (4.48), -25.02 (4.2), and -23.46 (3.56), respectively, outside the acceptance

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		range of ±13%. Evaluations of the results relative to TDS, specific conductivity, and speciation of the sulfate ion at low pH indicates that the sulfate analyses were likely biased high. Therefore the sulfate result for that sample was qualified as J TvP-H.
Field QC • Field Duplicate (FD) MMW-7-T01D-GRW MMW-7-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package included field duplicate (FD) samples that were slightly outside the control criteria as summarized in Table 1.6. The field quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness and it was noted in the inorganics that phosphorus was accidentally written as phosphate. The phosphate line was crossed out and correctly revised by hand on the original form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	No	Benzaldehyde reported a %RSD of 33.6% for the initial calibration of semivolatile organics run on 11/12/02. The evaluative criterion for initial calibration %RSD is 30%. As a result, benzaldehyde in all samples were qualified as estimated (J/UJ) with an indeterminate bias direction and a qualifier code of "ICAL".
Initial/Continuing Calibration Verification	No	Benzaldehyde was recovered in the two semivolatile organics continuing calibration verifications run on 11/14/02 and 11/15/02 at 32.6% and 38.7%, respectively. Accordingly, benzaldehyde in all samples were qualified as estimated (J/UJ) with an indeterminate bias direction and a qualifier code of "CCAL". As mentioned in the laboratory case narrative, the cyanide analyses of the initial calibration check standard associated with this data package reported recoveries in excess of the control criteria, indicating a potential high bias. Due to the fact that cyanide was not detected in any of the associated field samples, no qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Laboratory Control Sample Results	No	The laboratory case narrative noted the nitroaromatics analysis of the blank spike samples D1LCS and D1LCSD yielded slightly low percent recoveries for PYX (62% and 60%, respectively). Due to the fact that the laboratory has not yet established control limits for this compound, the default criteria of 70-130% was applied. Since the LCS and LCSD recoveries were less than the lower limit but > than 10%, PYX results in all samples was qualified as estimated (UJ) with a low bias direction.
Compound Identification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS		Information regarding the mass calibration and resolution are not available due to the software limitations. However, acceptable performance can be inferred from the other QC sample results, which satisfied evaluation criteria. No samples contained concentrations of any of the interferent elements (Al, Ca, Mg, and Fe) comparable to those in the ICSs. As such, it was not necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements).

Table 1.1
Holding Time Qualifications

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Sulfate (mg/L)
MMW-10A-T01N-GRW	5.40 J	0.005 UJ	0.030 J	---	---
MMW-10B-T01N-GRW	0.79 J	0.005 UJ	0.010 UJ	---	---
MMW-17A-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ	---	---
P-2-T01N-GRW	3.50 J	0.005 UJ	0.010 UJ	---	---
MMW-21-T01N-GRW	1.3 J	0.005 UJ	0.20 J	4300 J	3380 J
MMW-7-T01N-GRW	0.40 UJ	0.005 UJ	14.6 J	9640 J	---
MMW-28A-GRW	0.56 J	0.005 UJ	0.010 UJ	---	---
MMW-28B-T01N-GRW	0.61 J	0.005 UJ	0.010 UJ	---	---
MMW-7-T01D-GRW	0.40 UJ	0.005 UJ	14.2 J	14400 J	7500 J
MMW-22-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ	4690 J	3990 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P)	---	---	0.3	0.2	---	---	0.2	MMW-28A-D01N-GRW, MMW-28A-T01N-GRW	U CCB-I
Iron (P)	---	---	46.6	24.2	25.1	62.96	22.6	MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, MMW-10B-D01N-GRW, MMW-17A-T01N-GRW, MMW-17A-D01N-GRW, MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-28B-T01N-GRW, MMW-28B-D01N-GRW, P-2-T01N-GRW, P-2-D01N-GRW	U MB-I U CCB-I
Lead (P)	---	---	---	---	---	1.523	1.1	MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, MMW-28B-T01N-GRW, MMW-28B-D01N-GRW, P-2-T01N-GRW	U MB-I
Selenium (MS)	-0.2	---	---	0.5	0.3	---	0.2	MMW-17A-T01N-GRW, MMW-17A-D01N-GRW, MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-28B-T01N-GRW, MMW-28B-D01N-GRW	UJ/ J CCB-L U CCB-I
Analyte	**CCB1 (µg/l)**	**CCB2 (µg/l)**	**CCB3 (µg/l)**	**CCB4 (µg/l)**	**CCB5 (µg/l)**	**MB (µg/l)**	**IDL or RL**	**Samples Qualified**	**Qualification Code**
Bis-(2-ethly hexyl) phthalate	---	---	---	---	---	1	10	MMW-28B-T01N-GRW, MMW-7-T01D-GRW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Recovery Not Meeting Criteria

Analyte	Matrix Spike Recovery	Matrix Spike Duplicate Recovery	PDS Recovery	Acceptance Limit	Action
MMW-17A-T01N-GRW					
Fluoride	15.4%	---	---	75-125%	Qualify parent sample UJ MS-L
Ammonia	130%	---	---		Qualify parent sample J MS-H
Bicarbonate Alkalinity	19.8%	---	---		Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery. No qualification was necessary.
Total Alkalinity	19.8%	---	---		
Cyanide	5.8%	---	114.0%		Qualify parent sample J MS, PDS-I
PYX	7.0	9.0%	---	70-130%	Qualify parent sample R MS-L
P-2-T01N-GRW					
Ammonia	65.0%	----	---	75-125%	Qualify parent sample J MS-L
Cyanide	14.5%	---	---		Qualify parent sample J MS-L
PYX	12.0%	13.0%	---	70-130%	Qualify parent sample UJ MS-L
P-2-D01N-GRW					
Arsenic	73.3%		78.1	75-125%	Qualify parent sample UJ MS, PDS-L

Table 1.4
Laboratory Duplicate Recovery Not Meeting Criteria

Sample/Analyte	Absolute Difference	RL	Action
MMW-17A-T01N-GRW • Nitrate	0.8	0.4	The laboratory duplicate results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Sample/Analyte	**RPD**	**RL**	**Action**
P-2-T01N-GRW • Sulfate • Bicarbonate alkalinity • Alkalinity • Ammonia • TOC	 34 28 23 200	 0.2 1.0 0.04 1.0	The laboratory duplicate results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Table 1.5
Serial Dilution Qualifications

Sample/Analyte	%Difference	Action
MW-17A-T01N-GRW • Zn	10.8%	The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.
P-2-T01N-GRW • Be • Mn	28.4% 17.4%	The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.
P-2-D01N-GRW • Al • Be • Cd • Ca • Cu • Mg • Mn • Zn	20.6% 28.7% 24.1% 23.0% 22.1% 20.4% 17.1% 31.8%	The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.
MMW-17A-D01N-GRW		None

Table 1.6
Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	MMW-7-T01N-GRW	MMW-7-T01D-GRW	Criteria Comment	Outside Criteria	RL	Action
TDS (mg/l)	9640	14400	RPD<30%	RPD=39.6%	5.0	J FD-H parent
TSS (mg/l)	45.3	24.2	Abs. Diff. <2xRL (4.0)	Abs Diff.=23.8	2.0	J FD-L parent
Phosphorus (mg/l)	2.4	24.2	RPD<30%	RPD=163%	0.01	J FD-H parent

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT021 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 01/16/03

Peer Reviewer: Alan Roberts Date Completed: 01/20/03

The table below summarizes the results presented in this data package.

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
P-1-T01N-GRW	SA	509328	P1T01NGRW	W	X	X	X	X	X		
P-1-D01N-GRW	SA	509329		W	X						
TB73T-GRW	TB	509330		W			X				
MMW-33A-T01N-GRW	SA	509331	33A-T01N-GRW	W	X	X			X		
MMW-33A-D01N-GRW	SA	509332		W	X						
P-5B-T01N-GRW	SA	509333	P5B-T01N-GRW	W	X	X			X		
P-5B-D01N-GRW	SA	509334		W	X						
P-5C-T01N-GRW	SA	509335	P5C-T01N-GRW	W	X	X			X		
P-5C-D01N-GRW	SA	509336		W	X						
FB03T-GRW	FB	509337		W			X	X	X		
RB10T-GRW	RB	509338		W	X	X	X	X			
RB10D-GRW	RB	509339		W	X						
TB69T-GRW	TB	509340		W			X				
TB29T-GRW	TB	509341		W			X				
TB84T-GRW	TB	509342		W	X		X				
TB83T-GRW	TB	509343		W	X		X				

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC sample is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, they are identified under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

During the alkalinity analysis of the samples in this sample delivery group (SDG), the associated blank samples yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). The concentration was less than the RL listed in the QAPP. The sample results were reported from this analysis as nondetect with a RL=1mg/L.. No qualification of the associated data was considered necessary.

The original Fluoride analysis of samples P-1-T01N-GRW and P-5C-T01N-GRW yielded concentrations that exceeded the calibrated range. These samples were re-analyzed within holding time yielding results that did not confirm those from the original analysis. These samples were reanalyzed a third time, beyond the holding time, yielding results comparable to the second analysis. The results from the second analysis have been formally presented in this SDG. The data from the third analysis has been provided in the raw section of the data package. No qualification of the associated data was considered necessary.

Molybdenum was reported from a trace ICP analysis for the samples in this SDG due to the presence of interference that resulted in the failure of the associated internal standard during the ICP/MS analysis. The failure of this internal standard also appears to affect the Selenium results obtained. For this reason Selenium has been reported from the trace ICP analysis as well. No qualification of the associated data was considered necessary.

The nitroaromatics analysis of laboratory control sample (LCS) samples L2LCS and L2LCSD yielded slightly low percent recoveries (LCS=60%, LCSD=68%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore they used the default criteria of 70-130. Since the LCS recovery is less than the lower limit but >10%, the associated sample results have been qualified as estimated ("UJ"/"J").

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory reported a lack of adequate preservative in samples P-1-T01N-GRW and MMW-33A-T01N-GRW that resulted in a possible loss of cyanide, therefore cyanide results for these samples are qualified as estimated "J" for positive results and "UJ" for nondetects. The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, and Orthophosphate were not met for some samples. Table 1.1 summarizes the holding time exceedances and the resultant data qualifications. Results for hold time exceedances reflect an indeterminate bias.
Laboratory Blank Results	No	Antimony, boron, nickel, 1,2-Dibromo-3-chloropropane, and 1,2,4-Trichlorobenzene were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned. In the negative results with potential low bias, concentrations that produce more than 25% effect on a reported sample or sample reporting limit were qualified as estimated ("J/UJ").
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control (QC) samples. However, the overall frequency was met for the Fall 2002 sampling event. The results will be used to formulate the overall assessment section of the RI/FS data validation report.
Method QC • Surrogates • Serial Dilution P-1-T01N-GRW • Internal Standards • Total vs. Partial Analyses	No	The surrogate for the explosives analysis was low in sample P-1-T01N-GRW, P-5B-T01N-GRW, P-5C-T01N-GRW, MMW-33A-T01N-GRW, and FB03T-GRW. The recovery of surrogate compound 1,2-dinitrobenzene were 78%, 84%, 82%, 84% and 81% respectively. These recoveries are outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Therefore, all positive and non-detect results for sample P-1-T01N-GRW, P-5B-T01N-GRW, P-5C-T01N-GRW, MMW-33A-T01N-GRW, and FB03T-GRW are qualified as estimated ("J/UJ").

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
• Cation/Anion Balance		The serial dilution test for sample P-1-T01N-GRW was applicable for 8 of the 24 metals. Of these 8 metals, the percent difference for 7 exceeded the evaluation criteria of ≤ 10%. Table 1.3 summarizes these results and data qualification issued Recoveries for internal standard Y were high for the ICPMS analysis of samples P-1-T01N-GRW, P-1-D01N-GRW, MMW-33A-T01N-GRW, MMW-33A-D01N-GRW, P-5B-T01N-GRW, P-5B-D01N-GRW, P-5C-T01N-GRW, P-5C-D01N-GRW, RB10T-GRW, and RB10D-GRW. All of these samples were re-analyzed by trace ICP analysis due to the presence of interference in the ICP/MS analysis as noted in the case narrative above. For samples P-1-T01N/D01N-GRW, MMW-33A-T01N/D01N-GRW, P-5B-T01N/D01N-GRW, P-5C-T01N/D01N-GRW and RB10T/D-GRW the absolute value of the percent difference between the anion/cation balance was –53.41 (pH=4.45), -49.89 (pH=4.33), -42.11 (pH=4.30), -59.31 (pH=4.33), and –35.51 (phone) respectively, outside the acceptance range of ±13%. Evaluations of the results in samples P1-T01N/D01N-GRW, MMW-33A-T01N/D01N-GRW, P-5A-T01N/D01N-GRW, and P-5C-T01N/D01N-GRW relative to TDS, specific conductivity, and speciation of the sulfate ion at low pH indicates that the sample analyses were likely biased high. Therefore the sulfate result for that sample was qualified as J TvP-H. The high concentration of sulfate in sample RB10T/D-GRW likely caused the out of balance bias towards the anions, as a result the anion/cation balance is biased higher than the acceptance range. Therefore, the sulfate result for that sample was qualified as J TvP-H.
Field QC • Field Duplicate • Rinsate Blank RB10T-GRW RB10D-GRW • Field Blank FB03T-GRW • Trip Blank TB73T-GRW TB69T-GRW TB29T-GRW TB84T-GRW TB83T-GRW • Other (e.g., splits)	No	There were a few detections in the rinsate and field blanks associated with these samples. These are summarized in Table 1.4 and 1.5. The blank results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness and it was noted in the inorganics that phosphorus was accidentally written as phosphate. The phosphate line was crossed out and correctly revised by hand on the original form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
parameters.		on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration All VOC initial and continuing calibration criteria were met in this SDG. Some SVOC initial and continuing calibration criteria were not satisfied. Table 1.6 summarizes initial calibration results not meeting criteria and the resultant data qualification. Table 1.7 summarizes continuing calibration results not meeting validation criteria and the resultant data qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)
P-1-T01N-GRW	3.8 J	---	---
MMW-33A-T01N-GRW	4.4 J	0.005 UJ	0.010 UJ
P-5B-T01N-GRW	4.3 J	0.005 UJ	0.010 UJ
P-5C-T01N-GRW	4.6 J	0.005 UJ	0.010 UJ
RB10T-GRW	0.40 UJ	0.005 UJ	0.010 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Boron (P)	5.2	4.8		4.8	P-1-T01N-GRW, P-1-D01N-GRW, MMW-33A-T01N-GRW, MMW-33A-D01N-GRW, P-5B-T01N-GRW, P-5B-D01N-GRW, P-5C-T01N-GRW, P-5C-D01N-GRW	U CCB-I
Nickel (MS)	---	---	-0.501	0.20	RB10T-GRW RB10D-GRW	UJ/J MS-L
Analyte	**CCB1 (µg/l)**	**CCB4 (µg/l)**	**MB (µg/l)**	**RL**	**Samples Qualified**	**Qualification Code**
Bis (2-Ethyl hexyl) phthalate	---	---	1	10	FB03T-GRW, RB10T-GRW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Qualifications

Sample/Analyte	%Difference	Action
P-1-T01N-GRW Al Be Cd Ca Cu Mg Zn	28.7% 32.2% 40.1% 30.7% 25.4% 28.3% 37.1%	The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.

Table 1.4
Positive Results for Rinsate Blanks

Analyte	RB01T-GRW (µg/l)
TDS (mg/L)	73
Sulfate (mg/L)	2.7
Bicarbonate Alkalinity (mg/L)	1.1
Total Alkalinity (mg/L)	1.1
Ammonia (mg/L)	0.015
TKN (mg/L)	0.24
Aluminum (µg/l)	36.1
Manganese (µg/l)	2.8
Methylene Chloride (µg/l)	2
Chloroform (µg/l)	6

Table 1.5
Positive Results for Field Blanks

Analyte	FB03T-GRW (µg/l)
Chloroform	8
Bis (2-ethylhexyl) phthalate	7

Table 1.6
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC ICAL Date/Time	Analyte	|%RSD| >30%	Samples	Qualification and Qualification Codes
11/12/03 (0846)	Benzaldehyde	33.6%	P-1-T01N-GRW, FB03T-GRW, RB10T-GRW	UJ ICAL-I

Table 1.7
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC CCAL Date/Time	Analyte	|%D| >25%	Samples	Qualification and Qualification Codes
11/14/02 (0533)	Benzaldehyde 2,2'-oxybis (1-Chloropropane)	32.6% -27.8%	P-1-T01N-GRW, FB03T-GRW, RB10T-GRW	UJ CCAL-I

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT022 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 12/17/02

Peer Reviewer: Stacey Coker Date Completed: 12/18/02

The table below summarizes the results presented in this data package.

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses						
				Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
MMW-19B-T01N-GRW	SA	509406	W	X	X			X		
MMW-19B-D01N-GRW	SA	509407	W	X						
LS1-T01N-GRW	SA	509408	W	X	X					
LS1-D01N-GRW	SA	509409	W	X						
LS2-T01N-GRW	SA	509410	W	X	X					
LS2-D01N-GRW	SA	509411	W	X						
RB09T-GRW	RB	509412	W	X	X					
MMW-3-T01N-GRW	SA	509413	W	X	X					
MMW-3-D01N-GRW	SA	509414	W	X						
MMW-31B-T01N-GRW	SA	509415	W	X	X			X		
MMW-31B-D01N-GRW	SA	509416	W	X						
RB04T-GRW	RB	509417	W	X	X			X		
RB04D-GRW	RB	509418	W	X						
MMW-32B-T01N-GRW	SA	509419	W	X	X			X		
MMW-32B-D01N-GRW	SA	509420	W	X						
COMPCAB-T01N-GRW	SA	509421	W	X	X			X		
COMPCAB-D01N-GRW	SA	509422	W	X						
MMW-2-T01N-GRW	SA	509423	W	X	X					
MMW-2-D01N-GRW	SA	509424	W	X						

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC sample is associated with.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Issues noted in the case narrative are summarized below and/or detailed in the comment section of the review matrix table below.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO3. These raw results have been converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate.

During the alkalinity analysis of the samples in this SDG performed 11/18/02, the associated blanks CCB1 and CCB2, yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the concentration was less than the RL listed in the QAPP, and therefore sample results were reported from this analysis.

During nitrate analysis performed 11/8/02, the associated initial calibration verification analysis yielded a percent recovery that exceeded control criteria. Please note that nitrate was not detected above the reporting limit and therefore not further action was taken.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample receiving forms noted that both the total and dissolved samples with the field ID Company Cabin were truncated to COMPCAB.
Holding Times	No	The holding times for Ammonia, Nitrate as N, Nitrite as N, and Orthophosphate were not met for some samples. Table 1.1 summarizes the holding time data qualifications. The associated bias direction is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, boron, iron, lead, and molybdenum were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS MMW-32B-T01N-GRW MMW-32B-D01N-GRW MS/MSD MMW-32B-T01N-GRW • LD MMW-32B-T01N-GRW MMW-32B-D01N-GRW	No	For matrix spike analysis on sample MMW-32B-T01N-GRW, the recoveries of cyanide and PYX were low. Table 1.3 summarizes these matrix spike results and the resultant data qualifications. Table 1.4 summarizes the laboratory duplicate results not meet the concentration-dependent evaluation criteria and the resultant data qualifications.
Method QC • Surrogates • PDS/GFAA QC • Serial Dilution MMW-32B-D01N-GRWL MMW-32B-T01N-GRWL • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate for the explosives analysis was low in one sample. The recovery of surrogate compound 1,2-dinitrobenzene was 84% in sample COMPCAB-T01N-GRW. This recovery is outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Therefore, all positive and non-detect results for sample COMPCAB-T01N-GRW were qualified as estimated ("J/UJ"). The serial dilution test for sample MMW-32B-D01N-GRWL was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 7 of the 24 metals. For each of these 7 metals, the % difference between the original and five-fold diluted results was ≤ 10%. As such, data qualification was not necessary. The serial dilution test for sample MMW-32B-T01N-GRWL was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 6 of the 24 metals. For each of these 6 metals, the % difference between the original and five-fold diluted results was ≤ 10%. As such, data qualification was not

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		necessary. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. Recoveries of the ICPMS internal standard Y were high for the initial and subsequent analyses of samples MMW-2-T01N-GRW and MMW-2-D01N-GRW. Because the interference in the ICPMS analysis could not be satisfactorily alleviated without excessive dilution, the molybdenum results for these two samples were reported from the ICP instrument. For samples RB04T/D-GRW and RB09T-GRW, the percent difference between the anion/cation balance was –19.49 and –20.38, respectively, outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary for AC Balance. For sample MMW-2-T01N/D01N-GRW the percent difference between the anion/cation balance was -18.57, outside the acceptance range of ±13%. Review of the result indicated that the sulfate milliequivalent result on the anion side is higher than the milliequivalent total of the cation results. Review of results from other samples indicates a generally high bias in the sulfate results. The pH of the sample was 5.19. Evaluation of the results relative to measured and calculated total dissolved solids speciation of the sulfate ion at lower pH's indicates that the sulfate analyses were likely biased high. The sulfate result will consequently be qualified as "J TvP-H".
Field QC • Field Duplicate • Rinsate Blank RB09T-GRW RB04T-GRW RB04D-GRW • Field Blank • Trip Blank • Other (e.g., splits)	Yes	There were a few detections in the rinsate blanks (RB) associated with groundwater samples. These are summarized in Table 1.5. The RB results for groundwater for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness and it was noted in the inorganics that phosphorus was accidentally written as phosphate. The phosphate line was crossed out and correctly revised by hand on the original form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. As noted in the case narrative, the nitrate recovery was high in the closing nitrate calibration verification standard for the 11-8-02 run (CCV#6). However, none of the samples reported in this package were associated with this CCV. As such, data qualification was not necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Ammonia (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)
MMW-19B-T01N-GRW	---	0.40 UJ	0.005 UJ	0.10 UJ
LS1-T01N-GRW	---	0.40 UJ	0.005 UJ	0.84 J
LS2-T01N-GRW	---	0.40 UJ	0.005 UJ	0.10 UJ
RB09T-GRW	---	0.40 UJ	0.005 UJ	0.10 UJ
MMW-3-T01N-GRW	---	0.40 UJ	0.005 UJ	0.10 UJ
MMW-31B-T01N-GRW	---	0.40 UJ	0.005 UJ	0.10 UJ
RB04T-GRW	---	0.40 UJ	0.005 UJ	0.10 UJ
MMW-32B-T01N-GRW	---	0.40 UJ	0.005 UJ	0.10 UJ
COMPCAB-T01N-GRW	0.070 J	0.40 UJ	0.005 UJ	0.10 UJ
MMW-2-T01N-GRW	---	0.40 UJ	0.005 UJ	0.10 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	RL	Samples Qualified	Qualification Codes
Boron (P)	5.6					4.8	MMW-19B-T01N-GRW, MMW-19B-D01N-GRW, LS1-T01N-GRW, LS1-D01N-GRW, LS2-T01N-GRW, LS2-D01N-GRW, MMW-3-T01N-GRW, MMW-3-D01N-GRW, MMW-31B-D01N-GRW, MMW-32B-T01N-GRW, MMW-32B-D01N-GRW, COMPCAB-T01N-GRW, COMPCAB-D01N-GRW, MMW-2-T01N-GRW, MMW-2-D01N-GRW	U CCB-I
Iron (P)					29.52	22.6	COMPCAB-T01N-GRW, COMPCAB-D01N-GRW	U MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	RL	Samples Qualified	Qualification Codes
Lead (MS)				0.2		0.10	MMW-3-T01N-GRW, MMW-31B-D01N-GRW, MMW-32B-D01N-GRW, COMPCAB-D01N-GRW	U CCB-I
Molybdenum (MS)		-0.2	-0.2		-0.447	0.20	RB09T-GRW, MMW-3-T01N-GRW, MMW-3-D01N-GRW, RB04T-GRW, RB04D-GRW	J or UJ MB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Qualifications for Metals and Inorganics

Sample/Analyte	Matrix Spike Recovery	Matrix Spike Recovery Duplicate	Post Digestion Spike	Acceptance Limit	Action
MMW-32B-T01N-GRW					
Cyanide	59.9%			75-125%	Qualify parent sample UJ MS-L
PYX	68%	70%		70-130%	Qualify parent sample UJ MS-L

Table 1.4
Laboratory Duplicate Detections Resulting in Qualification

Sample and Analytes	Applicable Criterion	Duplicate Result	Criteria	Qualification
MMW-32B-T01N-GRW Ammonia	Abs. Diff	1.2 x RL	Abs. Diff. ≤ RL	J D-I

RL = Reporting Limit (the instrument detection limit was used)

Abs. Diff. = Absolute difference (the RL was used for nondetect results)

Table 1.5
Positive Results for Rinsate Blanks

Analyte	RB09T-GRW	RB04T-GRW	RB04D-GRW	RL
Ammonia (mg/L)	0.055	0.063	NA	0.040
Bicarbonate Alkalinity (mg/L)	1	1.1	NA	1.0
Total Alkalinity (mg/L)	1	1.1	NA	1.0
Total Dissolved Solids (mg/l)	46	15	NA	5.0
Total Suspended Solids (mg/L)	0.50	U	NA	0.50
Copper (µg/l)	6.3	U	0.84	0.30

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT023 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Brice Woodlock Date Completed: 12/16/02

Peer Reviewer: Stacey Coker Date Completed: 12/22/02

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses						
				Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
LS-3-T01N-GRW	SA	509425	W	X	X					
LS-3-D01N-GRW	SA	509426	W	X						
MMW-47A-T01N-GRW	SA	509427	W	X	X	X	X	X		
MMW-47A-D01N-GRW	SA	509428	W	X						
TB81T-GRW	TB	509429	W			X				
TB82T-GRW	TB	509550	W			X				
ColWellNO1-T01N-GRW	SA	509551	W	X	X	X	X	X		
ColWellNO1-D01N-GRW	SA	509552	W	X		X				
ColWellNO2-T01N-GRW	SA	509553	W			X	X	X		
LABWELL-T01N-GRW	SA	509554	W	X	X		X			
LABWELL-D01N-GRW	SA	509555	W	X						
MW-17-T01N-GRW	SA	509556	W	X	X	X	X			
MW-17-D01N-GRW	SA	509557	W	X						
TB75-GRW	TB	509558	W			X				
MW-CH-T01N-GRW	SA	509559	W	X	X	X	X			
MW-CH-D01N-GRW	SA	509560	W	X						
TB58T-GRW	TB	509561	W			X				
OUTFALL002-T01N-GRW	SA	509562	W	X	X					
OUTFALL002-D01N-GRW	SA	509563	W	X						

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

Samples COLUMBINE WELL NO1-T01N-GRW and COLUMBINE WELL DO1-T01N-GRW were abbreviated to ColWellNO1-T01N-GRW and ColWellNO1-T01N-GRW, respectively, by the laboratory to accommodate field length limitations in processing the data summary forms.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3. These raw results have been converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen to the molecular weight of Nitrate.

During the alkalinity analysis of the samples in this SDG, the associated blank sample yielded an alkalinity concentration that was marginally above the laboratory's reporting limit. However, the concentration was less than the reporting limit listed in the QAPP. As such, the blank results were reported from this analysis.

The case narrative noted one .of the total phosphorous CCV recoveries was slightly below the acceptance range. This is discussed below.

The case narrative noted the metals analyses of the serial dilution yielded percent differences for several elements that exceeded control criteria. This is discussed below.

The associated interference check standards (ICSA and ICSAB) exhibited percent recoveries for molybdenum that exceeded control criteria for ICP/MS analyses for several samples. Samples MMW-47A-T01N-GRW and MMW-47A-D01N-GRW were reported for this analysis since this element was not detected above the reporting limit. This issue is discussed further.

The laboratory noted that molybdenum was reported from a trace ICP analysis for samples ColWellN01-T01N-GRW and ColWellN01-D01N-GRW due to the presence of interference that resulted in the failure of the associated internal standard during ICP/MS analysis.

The nitroaromatics analysis of laboratory control sample (LCS) samples L2LCS and L2LCSD yielded slightly low percent recoveries (LCS=60%, LCSD=68%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore they used the default criteria of 70-130. Since the LCS recovery is less than the lower limit but >10%, the associated sample results have been qualified as estimated ("UJ"/"J").

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Some of the 48-hour hold times for nitrate as N, nitrite as N, and ortho-phosphate were not met. Table 1.1 summarizes the resultant data qualifications. These results qualified for holding time are considered to have an indeterminate bias.
Laboratory Blank Results	No	Aluminum, boron, copper, iron, molybdenum, nickel, and potassium were detected in various blanks. Table 1.2 summarizes the blank detentions and the resultant data qualifications. In all cases, the reported value becomes the "effective" reporting limit and an indeterminate bias direction was assigned. Trace amounts of compounds 1,2-dibromo-3-chloropropane and 1,2,4-trichlorobenzene were detected in the VOC method blanks VBLKC4 and VBLKC7. The sample results for these compounds were all non-detect and therefore required no qualification of the data based on blanks. A trace amount of compounds diethylphthalate, di-n-butyl phthalate, and bis(2-ethyl hexyl) phthalate were detected in the SVOC method blank SBLKZ7. Only bis(2-ethyl hexyl) phthalate was detected in the one associated sample, MW47A-T01N-GRW. This compound result for this sample was qualified as non-detect at the RL.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution ColWellN01-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution test was applicable (i.e., the metal concentration >50xIDL adjusted for dilution) for only 9 of the 24 metals. Of these 9 metals, the percent difference for 8 exceeded the evaluation criteria of ≤10%. Table 1.3 summarizes these results and data qualification issued. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any additional data qualification issued will be summarized in the overall assessment. Recoveries for internal standard Y, was high for the ICPMS analysis of samples MMW-47A-T01N-GRW, MMW-47A-T01N-GRW, ColWellN01-T01N-GRW and ColWellN01-D01N-GRW. Samples MMW-47A-T01N-GRW and MMW-47A-T01N-GRW were not detected above the reporting limit and were reported from this analysis. Molybdenum results for samples ColWellN01-T01N-GRW and ColWellN01-D01N-GRW were reported from a trace ICP analysis due to the presence of interference that resulted in the failure of the associated internal standard during the ICP/MS analysis. For sample ColWellN01-T01N/D01N-GRW, the percent difference between the anion/cation balance was -20.62, outside the acceptance range of ±13%. Review of the result indicated that the sulfate milliequivalent result on the anion side is higher than the milliequivalent total of the cation results. Review of results from other samples indicates a generally high bias in the sulfate results. The pH of the sample was 5.17. Evaluation of the results relative to measured and calculated total dissolved solids speciation of the sulfate ion at lower pH's indicates that the sulfate analyses were likely biased high. The sulfate result will consequently be qualified as "J TvP-H". The surrogate for the explosives analyses was low in one sample. The recovery of 1,2-dinitrobenzene was 80%, outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Therefore, all positive and non-detect results for sample MMW-48A-T01N-GRW were qualified as estimated ("J/UJ").
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Others (e.g., splits)	NA	There were no detections in the various field quality control blanks. The field quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness and it was noted in the inorganics that phosphorus was accidentally written as phosphate. The phosphate line was crossed out and correctly revised by hand on the original form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. As noted in the case narrative, the CCV2 associated with the total phosphorus analysis yielded a percent recovery of 89.1%, slightly below the acceptance range of 90-110%. As such, the total phosphorus results for the associated samples were qualified as estimated (J/UJ) with a potential low bias. The affected samples are LS-3-T01N-GRW and MMW-47A-T01N-GRW.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		In the ICP/MS run, the recovery of molybdenum in the ICSAB sample was 124.1%, outside the acceptance range of 80-120%, suggesting a potential high bias. As the only molybdenum results reported from this run were non-detect, data qualification was not necessary. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration Some VOC and SVOC initial and continuing calibration criteria were not satisfied. Table 1.4 summarizes initial calibration results not meeting criteria and the resultant data qualification. Table 1.5 summarizes continuing calibration results not meeting validation criteria and the resultant data qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications

Sample	Nitrate as N (mg/l)	Nitrite as N (mg/l)	Orthophosphate (mg/l)
MMW-47A-T01N-GRW	2.7 J	0.005 UJ	0.010 UJ
MW-17-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ
OUTFALL002-T01N-GRW	NA	0.005 UJ	0.054 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	MB (µg/l)	CCB2 (µg/l)	CCB4 (µg/l)	RL	Samples Qualified	Qualification Codes
Copper (MS)	0.621			0.3	LS-3-T01N-GRW, MW-17-D01N-GRW, OUTFALL002-D01N-GRW, OUTFALL002-T01N-GRW	U MB-I
Molybdenum (P)		1.0		1.0	MW-CH-D01N-GRW	U CCB-I
Nickel (MS)	-0.447			0.2	MW-CH-D01N-GRW, MW-CH-T01N-GRW	UJ MB-L
Potassium (P)	275.3		444.8	274.5	LABWELL-D01N-GRW, LABWELL-T01N-GRW, LS-3-D01N-GRW, LS-3-T01N-GRW, MW-17-D01N-GRW, MW-17-T01N-GRW, MW-CH-D01N-GRW, MW-CH-T01N-GRW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank

RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Qualifications

Sample Analyte	%Difference	Action
ColWellN01-T01N-GRW		The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualifications will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.
Aluminum	26.5%	
Beryllium	25.9%	
Cadmium	32.9%	
Calcium	28.3%	
Magnesium	26.2%	
Manganese	30.8%	
Selenium	16.0%	
Zinc	33.6%	

Table 1.4
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC ICAL Date/Time	Analyte	|%RSD| >30%	Samples	Qualification and Qualification Codes
11/12/03 (0846)	Benzaldehyde	33.6%	COLWELLNO1-T01N-GRW, COLWELLNO2-T01N-GRW, LABWELL-T01N-GRW, MW-17-T01N-GRW, MW-CH-T01N-GRW, MMW-47A-T01N-GRW	UJ ICAL-I

Table 1.5
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Samples	Qualification and Qualification Codes
11/11/02 (2144)	Acetone	32.4%	TB82T-GRW, COLWELLNO1-T01N-GRW, COLWELLNO2-T01N-GRW, LABWELL-T01N-GRW, MW-17-T01N-GRW, TB75-GRW, MW-CH-T01N-GRW, TB58T-GRW	UJ/J CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Samples**	**Qualification and Qualification Codes**
11/14/02 (0533)	Benzaldehyde 2,2'-oxybis (1-Chloropropane)	32.6% -27.8%	MMW-47A-T01N-GRW	UJ CCAL-I
11/19/02 (0907)	Benzaldehyde 2,4-Dinitrophenol 4-Nitrophenol 4-Nitroaniline	-28.2% 58.4% 33.6% 26.4%	MMW-17-T01N-GRW, MMW-CH-T01N-GRW	UJ CCAL-I

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT024 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Brice Woodlock Date Completed: 12/16/02

Peer Reviewer: Stacey Coker Date Completed: 12/22/02

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses						
				Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
EW-1-T01N-GRW	SA	509591	W	X	X					
EW-1-D01N-GRW	SA	509592	W	X						
EW-2-T01N-GRW	SA	509593	W	X	X					
EW-2-D01N-GRW	SA	509594	W	X						
MW-20-T01N-GRW	SA	509595	W	X	X					
MW-20-D01N-GRW	SA	509596	W	X						
COLUMBINE2-T01N-GRW	SA	509597	W	X	X					
COLUMBINE2-D01N-GRW	SA	509598	W	X						
SPRING14-T01N-GRW+	SA	509599	W	X	X					
SPRING14-D01N-GRW+	SA	509600	W	X						
US-2-T01N-GRW	SA	509601	W	X	X					
US-2-D01N-GRW	SA	509602	W	X						
US-3-T01N-GRW	SA	509603	W	X	X					
US-3-D01N-GRW	SA	509604	W	X						
EW-4-T01N-GRW	SA	509605	W	X	X					
EW-4-D01N-GRW	SA	509606	W	X						
EW-3-T01N-GRW	SA	509607	W	X	X					
EW-3-D01N-GRW	SA	509608	W	X						
EW-5A-T01N-GRW	SA	509609	W	X	X					
EW-5A-D01N-GRW	SA	509610	W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

of the field ID indicates the sample matrix that the QC blank is associated with.

+This SPRING14 is along the mine site.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO3. These raw results have been converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen to the molecular weight of Nitrate.

During the alkalinity analysis of the samples in this SDG, the associated blank sample yielded an alkalinity concentration that was marginally above the laboratory's reporting limit. However, the concentration was less than the reporting limit listed in the Project QAPP. As such, the blank results were reported from this analysis.

The continuing calibration check standards immediately following the ICSABs on the ICP/MS instrument consistently yield elevated percent recoveries for aluminum due to carryover from the ICSABs. This issue is detailed below.

The case narrative noted that molybdenum was reported from a trace ICP analysis for samples COLUMBINE2-T01N-GRW, COLUMBINE2-D01N-GRW, SPRING14-T01N-GRW and SPRING14-D01N-GRW due to the presence of an interference that resulted in the failure of the associated internal standard during multiple ICP/MS analysis.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Some of the 48-hour hold times for nitrate as N, nitrite as N, and ortho-phosphate were not met. Table 1.1 summarizes the resultant data qualifications. These results qualified for holding time are considered to have an indeterminate bias.
Laboratory Blank Results	No	Aluminum, antimony, iron and molybdenum were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution SPRING14-T01N-GRW EW-1-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution test for sample EW-1-T01N-GRWL was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 1of the 24 metals. Of this 1 metal, the percent difference for 1 exceeded the evaluation criteria of ≤ 10%. Table 1.3 summarizes these results and data qualification issued. The serial dilution test for sample SPRING14-T01N-GRW was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 5 of the 24 metals. For each of these 5 metals, the % difference between the original and five-fold diluted results was ≤ 10%. As such, data qualification was not necessary. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. For samples US-2-T01N-GRW and SPRING14-T01N-GRW, the percent difference between the anion/cation balance was -13.55 and -45.49, respectively, outside the acceptance range of ±13%. Review of the result indicated that the sulfate milliequivalent result on the anion side is higher than the milliequivalent total of the cation results. Review of results from other samples indicates a generally high bias in the sulfate results. The sulfate result has therefore been qualified as "J TvP-H".

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		For sample COLUMBINE2-T01N-GRW, the percent difference between the anion/cation balance was -19.97, outside the acceptance range of ±13%. Review of the result indicated that the sulfate milliequivalent result on the anion side is higher than the milliequivalent total of the cation results. Review of results from other samples indicates a generally high bias in the sulfate results. The pH of the sample was 5.54. Evaluation of the results relative to measured and calculated total dissolved solids speciation of the sulfate ion at lower pH's indicates that the sulfate analyses were likely biased high. The sulfate result will consequently be qualified as "J TvP-H".
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Others (e.g., splits)	NA	There were no detections in the various field quality control blanks. The field quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	Corrected data sheets were submitted by the laboratory for an ICP Al blank (pg. 312), the associated LCS (pg. 324) and the associated analysis run log (pg. 352). The analytical package was evaluated for completeness and it was noted in the inorganics that phosphorus was accidentally written as phosphate. The phosphate line was crossed out and correctly revised by hand on the original form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	As noted in the case narrative, a recovery of aluminum in the CCV following the ICSAB was high. The recovery of aluminum was 113.8%, outside the acceptance range of 90-110%. The aluminum recovery in the next CCV was within limits. Data qualification was not necessary however, because no aluminum sample results were reported between the first and second CCVs in this run. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package

Table 1.1
Holding Time Qualifications

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)
EW-1-TOIN-GRW	0.58 J	0.005 UJ	0.010 UJ
EW-2-TOIN-GRW	0.62 J	0.005 UJ	0.010 UJ
COLUMBINE2-T01N-GRW	NA	NA	0.010 UJ
US-2-T0IN-GRW	NA	0.005 UJ	0.014 J
US-3-T0IN-GRW	NA	NA	0.010 UJ

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)
EW-4-TOIN-GRW	NA	0.005 UJ	0.037 J
EW-3-TOIN-GRW	0.40 UJ	0.005 UJ	0.010 UJ
EW-5A-TOIN-GRW	0.40 UJ	0.005 UJ	0.15 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	MB (µg/l)	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	IDL	Samples Qualified	Qualification Codes
Aluminum (MS)	3.034	6.6					3.0	EW-1-T01N-GRW EW-1-D01N-GRW EW-2-D01N-GRW MW-20-D01N-GRW US-3-T01N-GRW US-3-D01N-GRW EW-4-T01N-GRW EW-4-D01N-GRW EW-3-D01N-GRW EW-5A-T01N-GRW EW-5A-D01N-GRW	U MB-I
Antimony (MS)		0.3 B	0.3 B	0.2 B	0.2 B	0.2 B	0.2	EW-1-T01N-GRW EW-5A-D01N-GRW	U CCB-I
Iron (P)	31.74		25.1		28.2		22.6	EW-1-T01N-GRW EW-2-T01N-GRW EW-2-D01N-GRW MW-20-D01N-GRW COLUMBINE2-T01N-GRW COLUMBINE2-D01N-GRW SPRING14-T01N-GRW SPRING14-D01N-GRW US-2-D01N-GRW US-3-D01N-GRW EW-4-D01N-GRW EW-3-T01N-GRW EW-3-D01N-GRW EW-5A-T01N-GRW EW-5A-D01N-GRW	U MB-I U CCB-I
Iron (P)	23.5							EW-1-T01N-GRW EW-1-D01N-GRW EW-2-T01N-GRW EW-2-D01N-GRW MW-20-T01N-GRW MW-20-D01N-GRW COLUMBINE2-T01N-GRW COLUMBINE2-D01N-GRW	U MB-I
Molybdenum (P)				-1.5				SPRING14-T01N-GRW	UJ MB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Qualifications

Sample Analyte	%Difference	Action
EW-1-T01N-GRW Molybdenum	15.3 %	The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT025 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 12/12/03

Peer Reviewer: Stacey Coker Date Completed: 12/16/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
				Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
EW-SB-T01N-GRW	SA	509611	W	X	X					
EW-SB-D01N-GRW	SA	590612	W	X						
US-1-T01N-GRW	SA	509613	W	X	X					
US-1-D01N-GRW	SA	509614	W	X						
RB07T-GRW	RB	509615	W	X	X					
RB07D-GRW	RB	509616	W	X						
EW-6(MW-3)-T01N-GRW	SA	509617	W	X	X					
EW-6(MW-3)-D01N-GRW	SA	509618	W	X						
EW-5D-T01N-GRW	SA	509619	W	X	X					
EW-5D-D01N-GRW	SA	509620	W	X						
MW-2-T01N-GRW	SA	509744	W	X	X					
MW-2-D01N-GRW	SA	509745	W	X						
MW-24-T01N-GRW	SA	509746	W	X	X					
MW-24-D01N-GRW	SA	509747	W	X						
DOUGLASWELL-T01N-GRW	SA	509748	W	X	X			X		
DOUGLASWELL-D01N-GRW	SA	509749	W	X						
MMW-40A-T01N-GRW	SA	509750	W	X	X	X	X	X		
MMW-40A-D01N-GRW	SA	509751	W	X						
TB51T-GRW	TB	509752	W			X				

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC sample is associated with.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were summarized in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory abbreviated some sample identifiers. The electronically formatted data provided the full field IDs. Any abbreviated field IDs on the sample forms were hand-corrected by the data validationer.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO3. These raw results have been converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen to the molecular weight of Nitrate.

During the alkalinity analysis of the samples in this SDG, the associated blank sample yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the concentration was less than the RL listed in the QAPP, and therefore sample results were reported from this analysis.

During the metals analysis the initial calibration verification sample associated with the samples in this SDG yielded a percent recovery for potassium that marginally exceeded the upper control limit. This is described below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were four issues noted with sample receipt. These are described below. For sample EW-5D-T01N-GRW, the total and dissolved metals labels were accidentally put on the wrong bottles. The laboratory suspected the error because the bottle codes were marked on the tops of the bottles. The laboratory logged the samples in according to the W-1 and W-2 bottle code on the bottles (rather than sample labels). The analytical results confirmed that this was the correct resolution (i.e., the total metals results are ≥ the dissolved metals results). Sample RB07D-GRW was inadvertently recorded on the COC twice. However, based on the analyses requested, and the labels on the bottles received, the second entry should have been recorded as RB07T-GRW. The laboratory logged the sample in correctly and the requested analyses were conducted. It was determined after shipment that the field sample recorded on the COC as MW-40A-T01N/D01N-GRW was really MMW-40A-T01N/D01N-GRW. The laboratory was notified by fax and the sample was logged in with the correct field ID. The field ID MW-2-D01N-GRW erroneously was written on the COC twice with times of 1130 and 1200. The sample collected at 1200 should have been recorded as MW-24-D01N-GRW. Similarly, the field ID MW-24-T01N-GRW was recorded on the COC with collection times of 1130 and 1200. The sample collected at 1130 should have been recorded as MW-2-T01N-GRW. The sample labels were correct and the laboratory logged the samples in by the sample labels on the bottles.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, and Orthophosphate were not met. Table 1.1 summarizes the holding time data qualification. Results qualified for holding times are considered to have an indeterminate bias.
Laboratory Blank Results	No	Aluminum, antimony, iron, lead, molybdenum, and selenium were detected in various blanks. Table 1.2 summarizes the blank detentions and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Yes	Although there were no project-specific matrix QC samples in this package, the overall matrix QC frequency was met for the Fall 2002 sampling event. The results will be used to formulate the accuracy and precision sections of the overall assessment.
Method QC • Surrogates DOUGLASWELL-T01N-GRW • Serial Dilution EW-5B-T01N-GRW • Internal Standards	No	The surrogate for explosives analysis was low in one sample. The recovery of 1,2-dinitrobenzene (84%) was below the acceptance criteria of 85%-116%, but greater than 10%, suggesting a potential low bias in the associated sample results. Therefore, all positive and non-detect results for sample DOUGLASWELL-T01N-GRW are qualified as estimated ("J/UJ"). The serial dilution test for sample EW-5B-T01N-GRWL was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 6 of the 24 metals. For each of

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
• Total vs. Partial Analyses • Cation/Anion Balance		these 6 metals, the % difference between the original and five-fold diluted results was ≤ 10%. As such, data qualification was not necessary. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. One ICP/MS internal standard was high in samples MW-24-T01N-GRW, DOUGLASWELL-T01N-GRW, and DOUGLASWELL-D01N-GRW. The recoveries of the internal standard yttrium were 144%, 273%, and 268%, respectively, outside the acceptance range of 30-120%. The laboratory did not report analytes (Mo) quantitated with this internal standard from these analyses. For these samples, the molybdenum results were reported from a tenfold dilution for which the internal standard recovery was satisfactory. As such data qualification was not necessary. The orthophosphate and phosphorus results for sample MW-2-T01N-GRW were qualified as estimated (J/UJ TVP-I) because the orthophosphate result was greater than the phosphorus result. The molybdenum results for sample MMW-40A-T01N/D01N-GRW were qualified as estimated (J/UJ TVP-I) because the dissolved molybdenum result was greater than the total molybdenum result. For sample EW-5B-T01N–GRW, the percent difference between the anion/cation balance was -23.52, outside the acceptance range of ±13%. Review of the result indicated that the sulfate milliequivalent result on the anion side is higher than the milliequivalent total of the cation results. Review of results from other samples indicates a generally high bias in the sulfate results. The sulfate result has therefore been qualified as "J TvP-H". For samples US-1-T01N -GRW, and RB07T-GRW, the percent difference between the anion/cation balance was -15.59 and -18.2, respectively, outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary for AC Balance.
Field QC • Field Duplicate DOUGLASWELL-T01D-GRW DOUGLASWELL-D01D-GRW • Rinsate Blank RB07T-GRW RB07D-GRW • Field Blank • Trip Blank TB51T-GRW • Other (e.g., splits)	No	The field duplicate pair associated with DOUGLASWELL-T01N/D01N-GRW are presented in WAT026. There were a few detections in the rinsate blanks (RB) for groundwater. These are summarized in Table 1.3. The RB results for groundwater for the Fall 2002 event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. There was a detection in the trip blank (TB) for groundwater. These are summarized in Table 1.4. All instances of non-detect results with elevated RL are due to results being qualified as non-detect on the basis of blanks results. In these cases, the reporting value becomes the "effective" RL (i.e., the RL is raised to the reported value).
Nondetect Results w/ Elevated RLs?	Yes	Besides results qualified as nondetect on the basis of method blanks (in which case the reported value becomes the "effective" reporting limit), there were two samples with nondetect results with elevated reporting limits. The molybdenum results for samples DOUGLASWELL-T01N-GRW and DOUGLASWELL-D01N-GRW were reported as nondetect with a reporting limit of 2.0 ug/l, rather than 0.20 ug/l due to a dilution necessary to reduce matrix interference on the internal standard. This elevated reporting limit is still below the QAPP required RL of 3.0 ug/l. As such, the elevated reporting limit should not affect the usability of the data. Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness and it was noted in the inorganics that phosphorus was accidentally written as phosphate. The phosphate line was crossed out and correctly revised by hand on the original form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. ICV-The recovery of molybdenum was slightly high on the ICP ICV at 110.8%. However, all molybdenum results were reported from the ICP/MS. As such, this slightly high recovery does not affect the quality of the data and data qualification was not necessary. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial and continuing calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)
EW-5B-T01N-GRW	0.40 UJ	0.005 UJ	0.11 J
US-1-T01N-GRW	0.40 J	0.005 UJ	0.010 UJ
RB07T-GRW	0.40 J	0.005 UJ	0.010 UJ
EW-6(MW-3)-T01N-GRW	0.40 UJ	0.005 UJ	0.016 UJ
EW-5D-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ
MW-24-T01N-GRW	1.4 J	0.005 UJ	0.010 UJ
MMW-40-T01N-GRW	0.40 UJ	0.005 UJ	0.092 J
MW-2-T01N-GRW	2.0 J	0.005 UJ	0.036 J
DOUGLASWELL-T01N-GRW	1.9 J	0.005 UJ	0.010 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (MS)	3					3.0	EW-5B-T01N-GRW, US-1-D01N-GRW, EW-6(MW-3)-T01N-GRW, MW-2-D01N-GRW	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	0.5	0.3	0.4	0.4		0.20	EW-5B-T01N-GRW, MW-2-D01N-GRW, MW-24-T01N-GRW	U CCB-I
Lead (MS)				0.1		0.10	EW-5B-T01N-GRW, EW-5B-D01N-GRW, EW-5D-D01N-GRW, MW-2-D01N-GRW,	U CCB-I
Selenium (MS)	0.4	0.9	0.6	0.5	0.241	0.20	EW-5B-T01N-GRW, EW-5B-D01N-GRW, US-1-T01N-GRW, US-1-D01N-GRW, RB07T-GRW, RB07D-GRW, EW-6(MW-3)-T01N-GRW, EX-6(MW-3)-D01N-GRW, EW-5D-T01N-GRW, EW-5D-D01N-GRW, MW-2-T01N-GRW, MW-2-D01N-GRW, MW-24-D01N-GRW, MMW-40A-T01N-GRW. MMW-40A-D01N-GRW	U CCB-I U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Positive Rinsate Blank Results

Analyte	RB07T-GRW	RB07D-GRW	RL
Arsenic (MS) (µg/l)	0.26	0.36	0.20
Copper (MS) (µg/l)	---	0.70	0.30
Total Dissolved Solids (mg/L)	10	---	5.0
Bicarbonate Alkalinity (mg/L)	1.1	---	1
Total Alkalinity (mg/L)	1.1	---	1
Ammonia (mg/L)	0.099	---	0.040

P= ICP MS=ICP-MS RL= Reporting Limit

Table 1.4
Positive Trip Blank Results and Qualifications

Analyte	TB51T-GRW	RL*	Qualification and Codes
4-methyl-2-Pentanone (µg/l)	1	10	Data qualification was not necessary because this analyte was not detected in the associated sample.

RL= Reporting Limit

*Reporting limit used for CLP metals is the Contract Required Quantitation Limit (CRQL)

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT026 and WAT026A Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson/Stacey Coker Date Completed: 01/20/03, revised 3/30/05

Peer Reviewer: Stacey Coker/Alan Roberts Date Completed: 01/22/03, revised 3/30/05

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
FAGERQUISTWELL-T01N-GRW	SA	509767	FQUISTWELL-T01N-GRW or TWELLT01NGRW	W	X	X			X		
FAGERQUISTWELL-D01N-GRW	SA	509768	FQUISTWELL-D01N-GRW	W	X						
DOUGLASWELL-T01D-GRW	FD	509769	SWELLT01NGRW	W	X	X			X		
DOUGLASWELL-D01D-GRW	FD	509770		W	X						
P-4B-T01N-GRW	SA	509771	P-4B-T01NGRW	W	X	X			X		
P-4B-D01N-GRW	SA	509772		W	X						
TB67T-GRW	TB	509851		W			X				
MINE1-T01N-GRW	SA	509852	MINE1T01NGRW or MINE1-GRW	W	X	X	X	X[3]	X		
MINE1-D01N-GRW	SA	509853		W	X						
MMW-42A-T01N-GRW	SA	509854		W	X	X					
MMW-42A-D01N-GRW	SA	509855		W	X						
MMW-44A-T01N-GRW	SA	509936	MW44AT01NGRW or MMW-44A-GRW	W	X	X	X	X[3]	X		
MMW-44A-D01N-GRW	SA	509937		W	X						
TB77T-GRW	TB	509938		W			X				
MMW-38A-T01N-GRW	SA	509939	MW38AT01NGRW	W	X	X			X		
MMW-38A-D01N-GRW	SA	509940		W	X						
TB70T-GRW	TB	510171		W			X				
MMW-44B-T01N-GRW	SA	510172	MW44BT01NGRW or MMW-44B-GRW	W	X	X	X	X[3]	X		
MMW-44B-D01N-GRW	SA	510173		W	X						
TB76T-GRW	TB	510174		W			X				

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
MMW-39A-T01N-GRW	SA	510175	MW39AT01NGRW or MMW-39A-GRW	W	X	X	X	X[3]	X		
MMW-39A-D01N-GRW	SA	510176		W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

[3] The SVOC results were reported in WAT026A.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, not addressed by the review summary table, were noted in the case narrative.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) were initially expressed as Nitrate as NO_3. The raw results were converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen the molecular weight of Nitrate. The laboratory has issued replacement data sheets that have been collated in with the original data sets. The original nitrate data sheets for the affected packages have been marked as superseded.

During the alkalinity analysis of the samples in this SDG, the associated blank samples CCB1 and CCB2 yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the concentration was less than the RL listed in the QAPP, and therefore sample results were reported from this analysis. No qualification of the associated data was considered necessary.

During the Total Phosphorus analysis performed 11/20/02, the associated continuing calibration verification analysis designated as CCV2 yielded a percent recovery of 89.1%, which falls marginally below the lower control limit of 90%. The associated samples were not re-analyzed. Since the CCV recovery was less than the lower control limit, the total phosphorus result for the associated sample, FAGERQUISTWELL-T01N-GRW, has been qualified as estimated (UJ).

The original Total Dissolved Solids (TDS) analyses, which were performed within the holding time limit, yielded a net weight after drying that greatly exceeded the upper limit of the method for some samples. The affected samples were re-analyzed using a smaller sample volume. The re-analyses were conducted outside of the holding time. The results for the re-analyses were comparable to the original analyses. The results from the re-analyses have been formally reported in the case submittal. Table 1.1 below summarizes the qualification for TDS holding time.

Molybdenum was reported from a trace ICP analysis for the samples in this SDG due to the presence of interference that resulted in the failure of the associated internal standard during the ICP/MS analysis. No qualification in the associated data was considered necessary.

It was noted in the laboratory case narrative that the nitroaromatics analysis of laboratory control samples D1LCS and D1LCSD yielded a slightly low percent recovery (LCS=60%, LCSD=55%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

For the SVOCs analysis, manual integration was employed in deriving some results. Any results for which manual integrations were performed are noted on the quantitation reports and all pertinent extracted ion current profiles are included in the data package.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were problems noted with sample receipt. Sample TB77T-GRW was accidentally written on the COC as TB71T-GRW. The laboratory was contacted and the correction was made so that the sample was logged in with the correct field ID. FAGERQUIST WELL-T01N-GRW was truncated to FQUISTWELL-T01N-GRW. The laboratory noted that several samples for cyanide analysis were received at an improper pH, which may have resulted in possible loss of cyanide. The affected samples are P-4B-T01N-GRW, MMW-42A-T01N-GRW, MMW-44A-T01N-GRW, MMW-38A-T01N-GRW, MMW-44B-T01N-GRW, and MMW-39A-T01N-GRW. The nondetect results were qualified as estimated (UJ). The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	The 48-hour holding time for Nitrate as N, Nitrite as N, Orthophosphate, and the 7-day hold time for TDS were not met for several samples. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate. Additionally, the SVOC aliquot of sample MMW-39A-T01N-GRW was re-extracted 20 days past the 7-day collection to extraction holing time limit due to several extremely low surrogate recoveries. The results for the reanalysis were qualified as estimated (UJ HT-I) on the basis of the holding time exceedance. The results were not rejected because the results for the reanalysis confirmed the initial analysis (all nondetects). As noted in the method QC section, the results for the reanalysis were selected for reporting because all surrogate recoveries were within acceptance limits.
Laboratory Blank Results	No	Various metal and organic analytes were detected in various blanks. Tables 1.2 and 1.3 summarize the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned. In addition, a holding blank sample was stored with the samples (i.e., refrigerator blank) and analyzed. Acetone was reported as detected in the holding blank sample HB026 at an estimated concentration of 4 ug/l. As a result of this detection, the acetone results for samples MINE1-T01N-GRW was qualified as nondetect at the reporting limit (U HB – I).
Matrix QC MS/MSD/PDS LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution MMW-44A-T01N-GRW MMW-44B-T01N-GRW Internal Standards Total vs. Partial Analyses Cation/Anion Balance	No	For the SVOC analysis sample MMW-39A-T01N-GRW, three of the six surrogate compounds were recovered below the lower limits of the acceptance range. The laboratory re-extracted and re-analyzed the sample outside of the holding time limit. All surrogate recoveries for the re-extracted sample were within acceptance limits. As such, the results for the reanalysis were selected for reporting. The Form Is have been marked accordingly. The surrogate recovery for the explosive analysis was low in sample MMW-39A-T01N-GRW. The recovery of 1,2-dinitrobenzene was 83%. This recovery is outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Because the surrogate recovery is lower than the acceptance limit but greater than 10%, all explosive results for sample MMW-39A-T01N-GRW were qualified as estimated (UJ).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The serial dilution test for sample MMW-44A-T01N-GRW was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 1 of the 24 metals. Of this 1metal, the percent difference for 1 exceeded the evaluation criteria of ≤ 10%. Table 1.4 summarizes these results and data qualification issued. The serial dilution test for sample MMW-44B-T01N-GRW was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 9 of the 24 metals. Of these 9 metals, the percent difference for 2 exceeded the evaluation criteria of ≤ 10%. Table 1.3 summarizes these results and data qualification issued. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any additional data qualification issued will be summarized in the overall assessment. Recoveries for internal standards Y was high for the ICPMS analysis of samples MMW-44A-T01N-GRW, MMW-44A-D01N-GRW, MMW-38A-T01N-GRW, MMW-38A-D01N-GRW, MMW-39A-T01N-GRW, MMW-39A-D01N-GRW, MINE1-T01N-GRW, MMW-42A-T01N-GRW, MMW-42A-D01N-GRW, DOUGLASWELL-T01N-GRW, DOUGLASWELL-D01N-GRW, P-4B-T01N-GRW, and P-4B-D01N-GRW. Therefore, all molybdenum samples were reanalyzed and reported by trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recoveries for internal standard Tb was high for the ICPMS analysis of samples MMW-38A-T01N-GRW and MMW-38A-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. Recoveries for internal standard Bi was low for the ICPMS analysis of samples MMW-38A-T01N-GRW and MMW-38A-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. The copper results for sample MMW-44B-T01N/D01N-GRW were qualified as estimated (J/UJ TVP-I) because the dissolved copper result was greater than the total copper result. For samples DOUGLASWELL-T01N/D01N-GRW, P-4B-T01N/D01N-GRW, MMW-38A-T01N/D01N-GRW, MMW-42A-T01N/D01N-GRW, and MMW-44A-T01N/D01N-GRW, the absolute value of the percent differences between the anion/cation balance were high. The percent differences were –17.89 (pH=4.95), -44.25 (pH=4.51), -70.59 (pH=4.22) -26.75 (pH=3.22), and –78.74 (ph=3.87) respectively, outside the acceptance range of ±13%. Evaluations of the results relative to TDS, specific conductivity, and speciation of the sulfate ion at low pH indicates that the sulfate results were likely biased high. Therefore the sulfate results for these samples were qualified as estimated (J). A qualification code of "TvP-H" was assigned.
Field QC Field Duplicate (FD) DOUGLASWELL-T01D-GRW DOUGLASWELL-D01D-GRW Rinsate Blank (RB) Field Blank (FB) Trip Blank (TB) Other (e.g., splits)	No	This package included field duplicate (FD) samples that were slightly outside the control criteria as summarized in Table 1.5. Tetrachloroethene was detected at 0.9 ug/l in trip blank TB77T-GRW. Therefore, MMW-44A-T01N-GRW detection of tetrachloroethene at 1 ug/l was qualified as nondetect based on trip blank (U TB-I). The field quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1. Also, on Form X for the metal instrument detection limits, it was noted that the detection limit was not listed for molybdenum. The laboratory was contacted and a corrected Form X was issued.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. The LCS results for explosives were reviewed as summarized in the case narrative section. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: VOCs/SVOCs: Initial and Continuing Calibration The initial and continuing calibration results for some VOCs and SVOCs were outside acceptance limits. Tables 1.6 and 1.7 summarize the results and resultant data qualification issued. Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1

Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)
FQUISTWELL-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ	---
DOUGLASWELL-T01D-GRW	1.8 J	0.005 UJ	0.53 J	---
P-4B-T01N-GRW	3.6 J	0.005 UJ	0.010 UJ	---
MMW-44A-T01N-GRW	---	---	---	4300 J
MMW-38A-T01N-GRW	---	---	---	9700 J
MMW-39A-T01N-GRW	---	---	---	5020 J

Table 1.2

Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples qualified	Qualification Code
Antimony (MS)	0.3	0.2	0.2	0.2			0.20	MMW-39A-T01N-GRW	U CCB-I
Molybdenum (P)		1.9		1.2			0.20	FQUISTWELL-T01N-GRW, FQUISTWELL-D01N-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW	U CCB-I
Nickel (MS)						-0.62	0.20	FQUISTWELL-T01N-GRW, FQUISTWELL-D01N-GRW	UJ/ J MB-L
Selenium (MS)				0.2	0.2		0.20	FQUISTWELL-T01N-GRW, FQUISTWELL-D01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3

Organic Method Blank Detections Resulting in Data Qualification

Method Blank	Target Analytes [1]	Concentration	Samples Qualified	Qualification Code
SBLKB7	Bis(2-ethylhexyl)phthalate	1.0 ug/l	MMW-44B-T01N-GRW	U MB-I
SBLKE6	Bis(2-ethylhexyl)phthalate	0.5 ug/l	MMW-39A-T01N-GRWRE	U MB-I

Note: Results were qualified as nondetect at the RL (CRQL) if the reported value was <RL; otherwise, RL was raised to the reported value.

[1] Non-target analytes (i.e., tentatively identified compounds [TICs]) present in method blanks were not considered reportable as TICs in samples; as such, TIC results in samples that were also present in method blanks were qualified as unusable (R).

Table 1.4

Serial Dilution Qualifications

Sample Analyte	%Difference	Action
MMW-44A-T01N-GRW Se	21.4%	The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.
MMW-44B-T01N-GRW Ni K	11.6% 15.6%	The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the Fall 2002 sampling event.

Table 1.5

Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	DOUGLAS WELL-T01N-GRW	DOUGLAS WELL-T01D-GRW	Applicable Criterion	Exceedance	RL	Action
Sulfate (mg/l)	662	941	RPD<30%	RPD=35%	40	J FD-H parent
Orthophosphate (mg/l)	0.01	0.53	Abs. Diff. <2xRL (0.02)	Abs Diff.=0.52	0.01	UJ/J FD-L parent
Arsenic (µg/l)	0.21	1.2	Abs. Diff. <2xRL (0.4)	Abs Diff.=0.99	0.2	J FD-H parent
Selenium (µg/l)	7.2	12.9	RPD<30%	RPD=54%	0.2	J FD-H parent
Arsenic (µg/l)	0.2	1.5	Abs. Diff. <2xRL (0.4)	Abs Diff.=1.3	0.2	UJ/J FD-H parent
Selenium (µg/l)	7.2	12.6	RPD<30%	RPD=55%	0.2	J FD-H parent
Lead (µg/l)	2.4	0.97	Abs. Diff. <2xRL (0.2)	Abs Diff.=1.43	0.1	J FD-L parent

Table 1.6

VOC Calibration Results Resulting in Data Qualification

Calibration Type	Date	Analytes	%RSDs>30% or %D>25%	Samples Qualified	Qualification Code
CCAL	11-13-02 1745	Acetone	%D = 33.1%	MINE!-T01N-GRW TB67T-GRW	UJ CCAL - I
CCAL	11-18-02 2054	Acetone 2-Butatnone 1,2-Dichloroethane 1,3-Dibromo-3-chloropropane	%D = 28.2% %D = 25.8% %D = 25.7% %D = 41.8%	MMW-44B-T01N-GRW TB70T-GRW MMW-39A-T01N-GRW TB67T-GRW	UJ CCAL - I

Table 1.7

SVOC Calibration Results Resulting in Data Qualification

Calibration Type	Date	Analytes	%RSDs>30% or %D>25%	Samples Qualified	Qualification Code
ICAL	11-12-02	Benzaldehyde	%RSD = 33.6%	MINE1-T01N-GRW MMW-44A-T01N-GRW	UJ ICAL - I
CCAL	11-19-02 0907	2,4-Dinitrophenol 4-Nitroaniline 4-Nitrophenol 4,6-Dinitro-2-methylphenol	%D = 58.4% %D = 26.4% %D = 33.6% %D = 25.4%	MMW-44A-T01N-GRW	UJ CCAL - I
CCAL	12-12-02 0324	Benzaldehyde Phenol 2,2-oxybis(1-chloropane) hexacholorpentadiene 4-Nitrophenol	%D = 33.7% %D = 28.5% %D = 44.8% %D = 26.2% %D = 33.0%	MMW-39A-T01N-GRWRE	UJ CCAL - I
CCAL	12-06-02 1455	Benzaldehyde	%D = 35.5%	MMW-44B-T01N-GRW MMW-39A-T01N-GRW	UJ CCAL - I

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WAT027 Sampling Event: Fall 2002

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 12/15/02

Peer Reviewer: Stacey Coker Date Completed: 12/16/02

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses						
				Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
MMW-42B-T01N-GRW	SA	510353	W	X	X					
MMW-42B-D01N-GRW	SA	510354	W	X						
TB52T-GRW	TB	510355	W			X				
MMW-48A-T01N-GRW	SA	510356	W	X	X	X	X	X	X	
MMW-48A-D01N-GRW	SA	510357	W	X						
DECANT-T01N-SFW [2]	SA	510358	W	X	X					
DECANT-D01N-SFW	SA	510359	W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC sample is associated with.

[2] This sample was also analyzed for diesel range and motor oil range organics by EPA Method 8015M.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The nitrate results in the raw data for the field samples and quality control samples in the sample delivery group (SDG) are expressed as Nitrate as NO_3. These raw results have been converted to final results expressed as Nitrate as N by multiplying the raw results by 0.2259, which is the ratio of the atomic weight of Nitrogen to the molecular weight of Nitrate.

During the alkalinity analysis of the samples in this SDG, the associated blank CCB1 and CCB2 yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the concentration was less than the RL listed in the QAPP, and therefore sample results were reported from this analysis.

The explosives analysis yielded generally acceptable recoveries. However, the recovery of PYX was slightly outside default limits. However, at this time, the laboratory has not established limits control-charted control limits for this compound.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were problems noted with sample receipt. The cooler containing sample DECANT-T01N-SFW was received with bottles for BOD and COD analysis, however, the COC was not marked for the BOD or COD analysis. The laboratory was notified by fax to not run BOD or COD analysis on the DECANT-T01N-SFW sample as these are not required DP-933 parameters. However, the laboratory was requested to run diesel range total petroleum hydrocarbons (TPH) analysis on the sample aliquot in the W-6 bottle.
Holding Times	No	The 48-hour hold times for Nitrate as N, Nitrite as N, and Orthophosphate were not met. Table 1.1 summarizes the holding time detections and the resultant data qualifications. Results for hold time reflect an indeterminate bias.
Laboratory Blank Results	No	Aluminum, copper, potassium, and nickel were detected in various blanks. Table 1.2 summarizes the blank detentions and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control (QC) samples. However, the overall frequency was met for the Fall 2002 sampling event. The results will be used to formulate the overall assessment section of the RI/FS data validation report.
Method QC • Surrogates MMW-48A-T01N-GRW • Serial Dilution MMW-42B-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate for the explosives analysis was low in one sample. The recovery of 1,2-dinitrobenzene was 84%, outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Therefore, all positive and non-detect results for sample MMW-48A-T01N-GRW were qualified as estimated ("J/UJ"). The serial dilution test for sample MMW-42B-T01N-GRWL was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 8 of the 24 metals. For each of these 8 metals, the % difference between the original and five-fold diluted results was ≤ 10%. As such, data qualification was not necessary. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. For sample DECANT-T01N/D01N-GRW, the absolute value of the percent difference between the anion/cation balance was high. The percent difference was –21.6%, outside the acceptance range of ±13%.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank TB52T-GRW • Other (e.g., splits)	Yes	
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness and it was noted in the inorganics that phosphorus was accidentally written as phosphate. The phosphate line was crossed out and correctly revised by hand on the original form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The LCS recovery of the explosive compound PYX was 62% which is outside the laboratory's default acceptance range of 70-130%. The duplicate LCS recovery of PYX was 70%. The QAPP acceptance range for this parameter is 75-125%. As such, the PYX results for all samples were qualified as estimated with a potential low bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial and continuing calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)
MMW-42B-T01N-GRW	0.40 UJ	0.021 J	0.010 UJ
MMW-48A-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB3 (µg/l)	MB (µg/l)	RL	Samples Qualified	Qualification Code
Aluminum (MS)	3.1			3.0	DECANT-D01N-SFW	U CCB-I
Copper (MS)			0.621		DECANT-T01N-SFW, DECANT-D01N-SFW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WATRAA1 Sampling Event: Fall 2002 Reanalysis

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 04/11/03

Peer Reviewer: Alan Roberts Date Completed: 04/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses			
					Hardness	Fluoride	Sulfate	Metal
SPRING13-D01N-GRWRE	SA	517694		W	X		X	X
CAPULIN SPRING-D01N-GRWRE	SA	517695	CAPULINSPG-D01N-GRWRE	W	X		X	X
CAPULIN1-D01N-GRWRE	SA	517696		W	X		X	X
LOWER SPRING 13-D01N-GRWRE	SA	517697	LOWERSPG 13-D01N-GRWRE	W	X	X	X	X
MMW-17B-D01N-GRWREQ	SA	517698		W	X		X	X
MMW-23A-D01N-GRWRE	SA	517699		W	X		X	X
MMW-36B-D01N-GRWRE	SA	517700		W	X		X	X
MMW-19A-D01N-GRWRE	SA	517701		W	X		X	X
MMW-19A-D01D-GRWRE	FD	517702		W	X	X	X	X
MMW-31A-D01N-GRWRE	SA	517703		W	X			X
MMW-31A-D01D-GRWRE	FD	517704		W	X			X
MMW-24-D01N-GRWRE	SA	517705		W	X			X
MMW-32A-D01N-GRWRE	SA	517706		W	X			X
P-3-D01N-GRWRE	SA	517707		W	X			X
MMW-11A-D01N-GRWRE	SA	517708		W	X			X
MMW-11A-D01D-GRWRE	FD	517709		W	X			X
MMW-10A-D01N-GRWRE	SA	517710		W	X			X
MMW-17A-D01N-GRWREQ	SA	517711		W	X			X
P-2-D01N-GRWRE	SA	517712			X			X
MMW-21-D01N-GRWRE	SA	517713			X			X
MMW-7-D01N-GRWRE	SA	517714			X			X
MMW-28B-D01N-GRWRE	SA	517715			X			X
MMW-7-D01D-GRWRE	FD	517716			X			X
MMW-22-D01N-GRWRE	SA	517717			X			X
P-1-D01N-GRWRE	SA	517718			X			X
MMW-33A-D01N-GRWRE	SA	517719			X			X
P-5B-D01N-GRWRE	SA	517720			X			X
P-5C-D01N-GRWRE	SA	517721			X			X
MMW-2-D01N-GRWRE	SA	517722			X			X
COLUMBINE WELL NO 1-D01N-GRWRE	SA	517723	COLWELLNO1-D01N-GRWRE		X			X

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses			
					Hardness	Fluoride	Sulfate	Metal
COLUMBINE2-D01N-GRWRE	SA	517724			X			X
SPRING14-D01N-GRWRE	SA	517725			X			X
DOUGLAS-D01D-GRWRE	FD	517726			X			X
P-4B-D01N-GRWRE	SA	517727			X			X
MMW-42A-D01N-GRWRE	SA	517728			X			X
MMW-44A-D01N-GRWRE	SA	517729			X			X
MMW-38A-D01N-GRWRE	SA	517730			X			X
MMW-17A-D01N-GRWREM	SA	517731	MMW-17A-D01N-GRWRE		X			X
MMW-17B-D01N-GRWREM	SA	517732	MMW-17B-D01N-GRWRE		X			X
DOUGLAS-D01N-GRWRE	SA	517733			X			X
SPRING 13-T01N-GRWRE	SA	517734				X	X	
CAPULIN SPRING-T01N-GRWRE	SA	517735	CAPULINSPG-T01N-GRWRE			X	X	
CAPULIN1-T01N-GRWRE	SA	517736				X	X	
LOWER SPRING 13-T01N-GRWRE	SA	517737	LOWERSPPG13-T01N-GRWRE			X	X	
MMW-17B-T01N-GRWREQ	SA	517738	MMW-17B-T01N-GRWRE				X	
MMW-23A-T01N-GRWRE	SA	517739				X	X	
MMW-36B-T01N-GRWRE	SA	517740				X	X	
MMW-19A-T01N-GRWRE	SA	517741				X	X	
MMW-19A-T01D-GRWRE	SA	517742				X	X	
MMW-31A-T01N-GRWRE	SA	517743				X	X	
MMW-31A-T01D-GRWRE	SA	517744				X	X	
MMW-24-T01N-GRWRE	SA	517745				X	X	
MMW-32A-T01N-GRWRE	SA	517746				X	X	
P-3-T01N-GRWRE	SA	517747				X	X	
MMW-11A-T01N-GRWRE	SA	517748				X	X	
MMW-11A-T01D-GRWRE	FD	517749				X	X	
MMW-10A-T01N-GRWRE	SA	517750				X	X	
MMW-17A-T01N-GRWREQ	SA	517751	MMW-17A-T01N-GRWRE				X	
P-2-T01N-GRWRE	SA	517752				X	X	
MMW-21-T01N-GRWRE	SA	517753				X	X	
MMW-7-T01N-GRWRE	SA	517754				X	X	
MMW-28B-T01N-GRWRE	SA	517755				X	X	
MMW-7-T01D-GRWRE	FD	517756				X	X	
MMW-22-T01N-GRWRE	SA	517757				X	X	
P-1-T01N-GRWRE	SA	517758				X	X	
MMW-33A-T01N-GRWRE	SA	517759				X	X	
P-5B-T01N-GRWRE	SA	517760				X	X	
P-5C-T01N-GRWRE	SA	517761				X	X	
MMW-2-T01N-GRWRE	SA	517762				X	X	
COLUMBINE WELL NO 1-T01N-GRWRE	SA	517763	COLWELLNO1-T01N-GRWRE			X	X	
COLUMBINE2-T01N-GRWRE	SA	517764				X	X	
SPRING14-T01N-GRWRE	SA	517765				X	X	
DOUGLAS-T01D-GRWRE	FD	517766				X	X	
P-4B-T01N-GRWRE	SA	517767				X	X	
MMW-42A-T01N-GRWRE	SA	517768				X	X	

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses			
					Hardness	Fluoride	Sulfate	Metal
MMW-44A-T01N-GRWRE	SA	517769				X	X	
MMW-38A-T01N-GRWRE	SA	517770				X	X	
MMW-17A-T01N-GRWREM	SA	517771	MMW-17A-T01N-GRWRE				X	
MMW-17B-T01N-GRWREM	SA	517772	MMW-17B-T01N-GRWRE				X	
DOUGLAS-T01N-GRWRE	SA	517773				X	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

These analytical results in this package are the re-analyses of sulfate, fluoride, and metals performed for groundwater samples collected in the fall 2002 as well as groundwater samples collected in December 2002.

In instances where samples from the same location were collected in both the monthly and quarterly sampling events, a suffix was added to the field ID to differentiate the samples. "M" was added for the monthly samples. "Q" was added for the quarterly samples. Additionally, the "RE" suffix was added for all samples to represent re-analyses.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Not Applicable	
Holding Times	No	The 28-day holding time for sulfate and fluoride were exceeded due to the samples being re-analyzed by a modified method to reduce matrix interferences present in the original analyses. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, arsenic, boron, chromium, copper, iron, manganese, molybdenum, and potassium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS MMW-17B-T01N/D01N-GRWREQ MMW-31A-T01N/D01N-GRWRE MMW-32A-T01N/D01N-GRWRE MMW-17A-T01N/D01N-	No	The matrix spike percent recovery was out of limits in samples MMW-17A-D01N-GRWREQ, MMW-17A-D01N-GRWREM, MMW-17A-D01N-GRWREQ, MMW-17B-D01N-GRWREQ, MMW-17B-D01N-GRWREQ, MMW-31A-D01N-GRWRE, MMW-32A-D01N-GRWRE, and P-2-D01N-GRWRE. Table 1.3 summarizes these matrix spike results. Parent samples were qualified on the basis of MS results per SOP 12.1. Samples MMW-17B-D01N-GRWREQ, MMW-31A-D01N-GRWRE, MMW-32A-D01N-GRWRE, MMW-17A-D01N-GRWREQ, P-2-D01N-GRWRE, and MMW-17A-D01N-GRWRE had inappropriate spike levels for one or all cadmium, chromium, iron, or selenium analyses. The dilutions of 10x (selenium) or 100x (cadmium, chromium, or iron) in these six samples caused spike concentration to fall below the reporting limit.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
GRWREQ P-2-D01N-GRWRE MMW-17A- T01N/D01N-GRWREM • LD MMW-17B-T01N/D01N-GRWREQ MMW-31A-T01N/D01N-GRWRE MMW-32A-T01N/D01N-GRWRE MMW-17A-T01N/D01N-GRWREQ P-2-D01N-GRWRE MMW-17A- T01N/D01N-GRWREM		The matrix spike results for each sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The post digestion spike recovery was out of limits in samples MMW-17A-D01N-GRWRE, MMW-31A-D01N-GRWRE, MMW-32A-D01N-GRWRE, and P-2-D01N-GRWRE. Table 1.4 summarizes these post digestion spike results. The post digestion spike results for each sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent samples were qualified on the basis of MS results per SOP 12.1
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analyses were conducted on samples MMW-17B-D01N-GRWREQ, MMW-31A-D01N-GRWRE, MMW-32A-D01N-GRWRE, MMW-17A-D01N-GRWQ, P-2-D01N-GRWRE, and MMW-17A-D01N-GRWREM. For samples MMW-31A-D01N-GRWRE, MMW-32A-D01N-GRWRE, and P-2-D01N-GRWRE the percent difference between the original result and result for the diluted sample for one analyte in 3 samples did not satisfy the ≤10% criterion. Table 1.5 summarizes these results and the resultant data qualifications. The serial dilution results for each sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples CAPULINSPG-D01N-GRWRE, CAPULIN1-D01N-GRWRE, MMW-23A-D01N-GRWRE, MMW-19A-D01N-GRWRE, MMW-19A-D01D-GRWRE, MMW-31A-D01N-GRWRE, MMW-31A-D01D-GRWRE, MMW-32A-D01N-GRWRE, P-3-D01N-GRWRE, MMW-11A-D01N-GRWRE, MMW-7-D01N-GRWRE, MMW-7-D01D-GRWRE, MMW-22-D01N-GRWRE, P-1-D01N-GRWRE, P-5C-D01N-GRWRE, MMW-44A-D01N-GRWRE, and MMW-38A-D01N-GRWRE. Similarly, the internal standard Tb was high for the IPCMS analysis of samples CAPULINSPG-D01N-GRWRE, CAPULIN1-D01N-GRWRE, MMW-23A-D01N-GRWRE, and MMW-38A-D01N-GRWRE. Data qualification was not necessary for either internal standard as none of the ICPMS analytes reported were quantitated using this standard. For samples MMW-17B-T01N-D01N-GRWREM, COLWELLNO1-T01N/D01N-GRWRE, and MMW-26B-T01N-/D01N-GRWRE the anion/cation were 17.9%, 16.1%, and 13.5% respectively, outside the acceptance range of ±13%. For these samples, the contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these samples results were considered necessary for charge balance.
Field QC • Field Duplicate MMW-19A-D01D-GRWRE MMW-31A-D01D-GRWRE MMW-11A-D01D-GRWRE MMW-7-D01D-GRWRE DOUGLAS-D01D-GRWRE • Rinsate Blank • Field Blank • Trip Blank • Other (e.g., splits)	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. These reanalyses followed this dilution scheme. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Not Applicable	Package reviewed for sample-specific parameters only.
Initial/Continuing Calibration Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Laboratory Control Sample Results	Not Applicable	Package reviewed for sample-specific parameters only.
Compound Identification	Not Applicable	Package reviewed for sample-specific parameters only.
Quantification	Not Applicable	Package reviewed for sample-specific parameters only.
Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	Not Applicable	Package reviewed for sample-specific parameters only.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Sulfate (mg/L)	Fluoride (mg/L)
SPRING13-T01N-GRWRE	966 J	9.6 J
CAPULINSPRG-T01N-GRWRE	11600 J	92.4 J
CAPULIN1-T01N-GRWRE	4360 J	38.5 J
LOWERSPG13-T01N-GRWRE	1540 J	14.4 J
MMW-17B-T01N-GRWREQ	631 J	---
MMW-23A-T01N-GRWRE	2240 J	55.5 J
MMW-36B-T01N-GRWRE	3050 J	34.8 J
MMW-19A-T01N-GRWRE	1740 J	32.9 J
MMW-19A-T01D-GRWRE	1690 J	33.7 J
MMW-31A-T01N-GRWRE	1630 J	33.4 J
MMW-31A-T01D-GRWRE	1690 J	35.2 J

Sample	Sulfate (mg/L)	Fluoride (mg/L)
MMW-24-T01N-GRWRE	1810 J	39.9 J
MMW-32A-T01N-GRWRE	1460 J	30.0 J
P-3-T01N-GRWRE	791 J	17.8 J
MMW-11A-T01N-GRWRE	1430 J	34.5 J
MMW-11A-T01D-GRWRE	1570 J	34.5 J
MMW-10A-T01N-GRWRE	1360 J	22.7 J
MMW-17A-T01N-GRWREQ	355 J	---
P-2-T01N-GRWRE	819 J	18.0 J
MMW-21-T01N-GRWRE	2510 J	23.3 J
MMW-7-T01N-GRWRE	5860 J	124 J
MMW-28B-T01N-GRWRE	434 J	2.2 J
MMW-7-T01D-GRWRE	6180 J	122 J
MMW-22-T01N-GRWRE	2660 J	32.5 J
P-1-T01N-GRWRE	1010 J	22.7 J
MMW-33A-T01N-GRWRE	1190 J	24.0 J
P-5B-T01N-GRWRE	1130 J	21.4 J
P-5C-T01N-GRWRE	1190 J	26.7 J
MMW-2-T01N-GRWRE	1440 J	10.6 J
COLWELLNO1-T01N-GRWRE	786 J	17.2 J
COLUMBINE2-T01N-GRWRE	631 J	11.2 J
SPRING14-T01N-GRWRE	279 J	2.8 J
DOUGLAS-T01D-GRWRE	677 J	14.1 J
P-4B-T01N-GRWRE	1170 J	23.4 J
MMW-42A-T01N-GRWRE	1350 J	21.8 J
MMW-44A-T01N-GRWRE	2660 J	24.5 J
MMW-38A-T01N-GRWRE	6400 J	82.4 J
MMW-17A-T01N-GRWREM	379 J	---
MMW-17B-T01N-GRWREM	361 J	---
DOUGLAS-T01N-GRWRE	649 J	14.3 J

Table 1.2
Metal Blanks

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P) DF=100	31 45.4		16.8	17.2				14.2	DOUGLAS-D01N-GRWRE, DOUGLAS-D01D-GRWRE, LOWERSPG-13-D01N-GRWRE, MMW-17A-D01N-GRWREM, MMW-17A-D01N-GRWREQ, MMW-17B-D01N-GRWREM, MMW-17B-D01N-GRWREQ, MMW-28B-D01N-GRWRE, MMW-2-D01N-GRWRE, SPRING13-D01N-GRWRE, SPRING14-D01N-GRWRE	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (P) DF=2							3.6	2.8	MMW-22-D01N-GRWRE, MMW-7-D01N-GRWRE, MMW-7-D01D-GRWRE	U MB-I
Arsenic (P) DF=10		2.8		3.2				2.3	CAPULIN1-D01N-GRWRE, CAPULINSPRG-D01N-GRWRE, MMW-10A-D01N-GRWRE, MMW-11A-D01N-GRWRE, MMW-19A-D01N-GRWRE, MMW-31A-D01D-GRWRE, MMW-32A-D01N-GRWRE, MMW-42A-D01N-GRWRE, MMW-7-D01N-GRWRE, P-2-D01N-GRWRE, SPRING14-D01N-GRWRE	U CCB-I
Boron (P) DF=1	7.6 5.5 4.7	4.9 4.7	4.5 7.3	3.3	3.8	5.6	4.8	2.7	MMW-17A-D01N-GRWREM, MMW-31A-D01D-GRWRE, SPRING13-D01N-GRWRE	U CCB-I U MB-I
Chromium (P) DF=100	-3.7	-3.9	-4.0					3.7	CAPULIN1-D01N-GRWRE, CAPULINSPRG-D01N-GRWRE, COLUMBINE2-D01N-GRWRE, COLWELLNO1-D01N-GRWRE, DOUGLAS-D01N-GRWRE, DOUGLAS-D01D-GRWRE, LOWERSPG13-D01N-GRWRE, MMW-10A-D01N-GRWRE, MMW-11A-D01N-GRWRE, MMW-11A-D01D-GRWRE, MMW-17A-D01N-GRWREM, MMW-17A-D01N-GRWREQ, MMW-17B-D01N-GRWREM, MMW-17B-D01N-GRWREQ, MMW-19A-D01N-GRWRE,	UJ CCB-L J CCB-L
Chromium (P) DF=100	-3.7	-3.9	-4.0					3.7	MMW-19A-D01D-GRWRE, MMW-21-D01N-GRWRE, MMW-22-D01N-GRWRE, MMW-23A-D01N-GRWRE, MMW-24-D01N-GRWRE, MMW-28B-D01N-GRWRE, MMW-2-D01N-GRWRE, MMW-31A-D01N-GRWRE, MMW-31A-D01D-GRWRE, MMW-32A-D01N-GRWRE, MMW-33A-D01N-GRWRE, MMW-36B-D01N-GRWRE, MMW-38A-D01N-GRWRE,	UJ CCB-L J CCB-L

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
									MMW-42A-D01N-GRWRE, MMW-44A-D01N-GRWRE, MMW-7-D01N-GRWRE, MMW-7-D01D-GRWRE, P-1-D01N-GRWRE, P-2-D01N-GRWRE, P-3-D01N-GRWRE, P-4B-D01N-GRWRE, P-5B-D01N-GRWRE, P-5C-D01N-GRWRE, SPRING13-D01N-GRWRE, SPRING14-D01N-GRWRE	
Copper (P) DF=100							4.3	1.7	CAPULIN1-D01N-GRWRE, COLWELLNO1-D01N-GRWRE, DOUGLAS-D01N-GRWRE, DOUGLAS-D01D-GRWRE, LOWERSPG13-D01N-GRWRE, MMW-10A-D01N-GRWRE, MMW-11A-D01N-GRWRE, MMW-11A-D01D-GRWRE, MMW-19A-D01N-GRWRE, MMW-19A-D01D-GRWRE, MMW-21-D01N-GRWRE, MMW-22-D01N-GRWRE, MMW-24-D01N-GRWRE, MMW-31A-D01N-GRWRE, MMW-31A-D01D-GRWRE, MMW-32A-D01N-GRWRE, MMW-33A-D01N-GRWRE, MMW-7-D01N-GRWRE, MMW-7-D01D-GRWRE, P-1-D01N-GRWRE, P-2-D01N-GRWRE, P-3-D01N-GRWRE, P-4B-D01N-GRWRE, P-5B-D01N-GRWRE, P-5C-D01N-GRWRE, SPRING13-D01N-GRWRE, SPRING14-D01N-GRWRE	U MB-I
Iron (P) DF=100	28.2			27.9 32.5				48.9	DOUGLAS-D01N-GRWRE, DOUGLAS-D01D-GRWRE, MMW-21-D01N-GRWRE, MMW-23A-D01N-GRWRE, MMW-24-D01N-GRWRE, MMW-38A-D01N-GRWRE, SPRING13-D01N-GRWRE	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Manganese (P) DF=100							0.7	0.5	NONE	Data qualification was not necessary, as all manganese results were sufficiently higher than 5x the blank concentration.
Molybdenum (P) DF=10			1.4 1.5				1.7	1.1	SPRING13-D01N-GRWRE	U CCB-I U MB-I
Potassium (P) DF=100					-267.3			201.8	CAPULIN1-D01N-GRWRE, CAPULINSPRG-D01N-GRWRE, COLUMBINE2-D01N-GRWRE, COLWELLNO1-D01N-GRWRE, DOUGLAS-D01N-GRWRE, DOUGLAS-D01D-GRWRE, LOWERSPG13-D01N-GRWRE, MMW-10A-D01N-GRWRE, MMW-11A-D01N-GRWRE, MMW-11A-D01D-GRWRE, MMW-17A-D01N-GRWREM, MMW-17A-D01N-GRWREQ, MMW-17B-D01N-GRWREM, MMW-17B-D01N-GRWREQ, MMW-19A-D01N-GRWRE, MMW-19A-D01D-GRWRE, MMW-21-D01N-GRWRE, MMW-22-D01N-GRWRE, MMW-23A-D01N-GRWRE, MMW-24-D01N-GRWRE, MMW-28B-D01N-GRWRE, MMW-2-D01N-GRWRE, MMW-31A-D01N-GRWRE, MMW-31A-D01D-GRWRE, MMW-32A-D01N-GRWRE, MMW-33A-D01N-GRWRE, MMW-36B-D01N-GRWRE, MMW-38A-D01N-GRWRE, MMW-42A-D01N-GRWRE, MMW-44A-D01N-GRWRE, MMW-7-D01N-GRWRE, MMW-7-D01D-GRWRE, P-1-D01N-GRWRE, P-2-D01N-GRWRE, P-3-D01N-GRWRE,	UJ CCB-L

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
									P-4B-D01N-GRWRE, P-5B-D01N-GRWRE, P-5C-D01N-GRWRE, SPRING13-D01N-GRWRE, SPRING14-D01N-GRWRE	

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Table 1.3
Matrix Spike Recovery Not Meeting Criteria for Sulfate and Metals

Sample/Analytes	Matrix Spike Recovery	Acceptance Limits
MMW-17A-D01N-GRWREQ		75-125%
Nickel	73.5%	
MMW-17A-D01N-GRWREM		
Cadmium	182.3%	
Cobalt	130.6%	
Copper	140.5%	
MMW-17B-D01N-GRWREQ		
Arsenic	140.5%	
Manganese	66.6%	
Nickel	71.4%	
MMW-17A-T01N-GRWREQ		
Sulfate	19.4%	
MMW-17B-T01N-GRWREQ		
Sulfate	67.9%	
MMW-31A-D01N-GRWRE		
Arsenic	171.8%	
Cadmium	171.5%	
Selenium	170.5%	
MMW-32A-D01N-GRWRE		
Arsenic	127.9%	
Cadmium	185.5%	
Copper	66.7%	
Selenium	73.6%	
P-2-D01N-GRWRE		
Arsenic	67.5%	
Cadmium	176.8%	
Nickel	164.4%	

Table 1.4
Post Digestion Spike Recovery Not Meeting Criteria

Sample/Analytes	PDS Recovery	Acceptance Limits
MMW-17A-D01N-GRWREQ Selenium	55.8%	75-125%
MMW-31A-D01N-GRWREQ Selenium	184.7%	
MMW-32A-D01N-GRWRE Selenium	66.1%	
P-2-D01N-GRWRE Selenium	139.1%	

Table 1.5
Serial Dilution Results Not Meeting Criteria

Sample/Analyte	%Difference
MMW-17B-D01N-GRW Mn	26.9%
MMW-32A-D01N-GRW Mn	10.6%
P-2-D01N-GRWRE Mn	49.0%

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WATRAA2 Sampling Event: Fall 2002 Reanalysis

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 04/10/03

Peer Reviewer: Alan Roberts Date Completed: 04/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses
					Metals
GOATHILL SPRING-D01N-GRWRE	SA	519272	GOATSPRING-D01N-GRW	W	X
MMW-39A-D01N-GRWRE	SA	519273		W	X
MMW-29A-D01N-GRWRE	SA	519274		W	X
MMW-10C-D01N-GRWRE	SA	519275		W	X
SPRING 39-D01N-GRWRE	SA	519276		W	X
MMW-47A-D01N-GRWRE	SA	519277		W	X
MMW-30A-D01N-GRWRE	SA	519278		W	X
MMW-11-D01N-GRWRE	SA	519279		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

These analytical results in this package are the re-analyses of Metals performed for groundwater samples collected in the Fall 2002.

The "RE" suffix was added for all samples to represent re-analyses.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Blanks	Yes	Boron, copper, manganese, molybdenum, potassium, and zinc were detected in various blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	No	For matrix spike analysis on sample MMW-11-D01N-GRWRE the recoveries of arsenic and iron were high. Table 1.2 summarizes these matrix spike results. The matrix spike results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	This serial dilution on sample MMW-11-D01N-GRWRE, pH class A, was applicable for 6 out of 24 analytes. Recovery for internal standard Y was high for the ICPMS analysis of samples GOATSPRING-D01N-GRWRE, MMW-39A-D01N-GRWRE, and MMW-11-D01N-GRWRE. Therefore, the molybdenum results for these were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Tb was high for the ICPMS analysis of sample GOATSPRING-D01N-GRWRE. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank • Other (e.g., splits)	Not Applicable	
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. These reanalyses followed this dilution scheme. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Not Applicable	Package reviewed for sample-specific parameters only.
Initial/Continuing Calibration Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Laboratory Control Sample Results	Not Applicable	Package reviewed for sample-specific parameters only.
Compound Identification	Not Applicable	Package reviewed for sample-specific parameters only.
Quantification	Not Applicable	Package reviewed for sample-specific parameters only.
Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Not Applicable	Package reviewed for sample-specific parameters only.

Table 1.1
Metal Blanks

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Boron (P) DF=10	4.5				3.295	2.7	MMW-29A-D01N-GRWRE, MMW-39A-D01N-GRWRE	U CCB-I U MB-I
Copper (P) DF=100					2.533	1.7	MMW-10C-D01N-GRWRE, MMW-11-D01N-GRWRE, MMW-29A-D01N-GRWRE, MMW-30A-D01N-GRWRE, SPRING 39-D01N-GRWRE	U MB-I
Manganese (P) DF=100		0.5				0.5	NONE	Data qualification was not necessary, as all manganese results were sufficiently higher than 5x the blank concentration.
Molybdenum (P) DF=10					1.34	6.7	MMW-10C-D01N-GRWRE, MMW-39A-D01N-GRWRE	U MB-I
Potassium (P) DF=100			300.5			201.8	MMW-30A-D01N-GRWRE, MMW-39A-D01N-GRWRE, MMW-47A-D01N-GRWRE	U CCB-I
Zinc (P) DF=100					6.896	3.9	MMW-10C-D01N-GRWRE, MMW-47A-D01N-GRWRE, SPRING 39-D01N-GRWRE	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Table 1.2
Matrix Spike Recovery Not Meeting Criteria for Metals

Sample/Analytes	Matrix Spike Recovery	Acceptance Limits
MMW-11-D01N-GRW		
Arsenic	171.0%	
Iron	147.6%	75-125%

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WATRAF1 Sampling Event: Fall 2002 Reanalysis

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 04/09/03

Peer Reviewer: Alan Roberts Date Completed: 04/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses
					Fluoride
GOATHILLSPRING-T01N-GRWRE	SA	519250	GOATHILSPG-T01N-GRW	W	X
MMW-10C-T01N-GRWRE	SA	519251		W	X
MMW-11-T01N-GRWRE	SA	519252		W	X
MMW-17A-T01N-GRWREQ	SA	519253	MMW-17A-T01N-GRWRE	W	X
MMW-17A-T01N-GRWREM	SA	519254	MMW-17A-T01N-GRWRE	W	X
MMW-17B-T01N-GRWREQ	SA	519255	MMW-17B-T01N-GRWRE	W	X
MMW-17B-T01N-GRWREM	SA	519256	MMW-17B-T01N-GRWRE	W	X
MMW-25B-T01N-GRWRE	SA	519257		W	X
MMW-29A-T01N-GRWRE	SA	519258		W	X
MMW-19B-T01N-GRWRE	SA	519259		W	X
MMW-30A-T01N-GRWRE	SA	519260		W	X
MMW-31B-T01N-GRWREQ	SA	519261	MMW-31B-T01N-GRWRE	W	X
MMW-31B-T01N-GRWREM	SA	519262	MMW-31B-T01N-GRWRE	W	X
MMW-34B-T01N-GRWRE	SA	519263		W	X
MMW-39A-T01N-GRWRE	SA	519264		W	X
MMW-40A-T01N-GRWRE	SA	519265		W	X
MMW-47A-T01N-GRWRE	SA	519266		W	X
MMW-48A-T01N-GRWREQ	SA	519267	MMW-48A-T01N-GRWRE	W	X
MMW-48A-T01N-GRWREM	SA	519268	MMW-48A-T01N-GRWRE	W	X
MMW-8B-T01N-GRWRE	SA	519269		W	X
MMW-8B-T01D-GRWRE	FD	519270		W	X
SPRING39-T01N-GRWRE	SA	519271		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

These analytical results in this package are the re-analyses of Fluoride performed for groundwater samples collected in the fall 2002 as well as the groundwater samples collected in December 2002.

In instances where samples from the same location were collected in both the monthly and quarterly sampling events, a suffix was added to the field ID to differentiate the samples. "M" was added for the monthly samples. "Q" was added for the quarterly samples. Additionally, the "RE" suffix was added for all samples to represent re-analyses.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Not Applicable	
Holding Times	No	The 28-day holding time for Fluoride was exceeded due to the samples being re-analyzed by a modified method to reduce matrix interferences present in the original analyses. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	Yes	
Matrix QC • MS/MSD/PDS • LD	Yes	
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Not Applicable	
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank • Other (e.g., splits)	Not Applicable	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Not Applicable	Package reviewed for sample-specific parameters only.
Initial/Continuing Calibration Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Laboratory Control Sample Results	Not Applicable	Package reviewed for sample-specific parameters only.
Compound Identification	Not Applicable	Package reviewed for sample-specific parameters only.
Quantification	Not Applicable	Package reviewed for sample-specific parameters only.
Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Not Applicable	Package reviewed for sample-specific parameters only.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Fluoride (mg/L)
GOATHILLSPRING-T01N-GRWRE	102 J
MMW-10C-T01N-GRWRE	13.4 J
MMW-11-T01N-GRWRE	8.1 J
MMW-17A-T01N-GRWREQ	1.7 J
MMW-17A-T01N-GRWREM	1.7 J
MMW-17B-T01N-GRWREQ	1.6 J
MMW-17B-T01N-GRWREM	1.7 J
MMW-25B-T01N-GRWRE	1.7 J
MMW-29A-T01N-GRWRE	40.0 J
MMW-19B-T01N-GRWRE	3.2 J
MMW-30A-T01N-GRWRE	28.9 J
MMW-31B-T01N-GRWREQ	14.3 J
MMW-31B-T01N-GRWREM	15.7 J
MMW-34B-T01N-GRWRE	129 J
MMW-39A-T01N-GRWRE	150 J
MMW-40A-T01N-GRWRE	1.9 J
MMW-47A-T01N-GRWRE	17.2 J
MMW-48A-T01N-GRWREQ	32.5 J
MMW-48A-T01N-GRWREM	33.1 J
MMW-8B-T01N-GRWRE	1.8 J
MMW-8B-T01D-GRWRE	1.9 J
SPRING39-T01N-GRWRE	6.2 J

MOLYCORP RI/FS
DATA VALIDATION SUMMARY

Data Package Number: WATRABC1 Sampling Event: Fall 2002 Reanalysis

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data validationer: Ansley Watson Date Completed: 04/11/03

Peer Reviewer: Alan Roberts Date Completed: 04/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses			
					Hardness	Fluoride	Sulfate	Metal
MWB-T01N-GRWRE	SA	517774		W			X	
MW-4-T01N-GRWRE	SA	517775		W			X	
MW-15-T01N-GRWRE	SA	517776		W			X	
MMW-10B-T01N-GRWRE	SA	517777		W		X	X	
MMW-28A-T01N-GRWRE	SA	517778		W			X	
US-2-T01N-GRWRE	SA	517779		W			X	
EW-5B-T01N-GRWRE	SA	517780		W			X	
US-1-T01N-GRWRE	SA	517781		W			X	
MW-24-T01N-GRWRE	SA	517782		W		X	X	
MW-B-D01N-GRWRE	SA	517783	MWB-D01N-GRWRE	W	X			X
MW-4-D01N-GRWRE	SA	517784		W	X			X
MW-15-D01N-GRWRE	SA	517785		W	X			X
MMW-10B-D01N-GRWRE	SA	517786		W	X			X
MMW-28A-D01N-GRWRE	SA	517787		W	X			X
US-2-D01N-GRWRE	SA	517788		W	X			X
EW-5B-D01N-GRWRE	SA	517789		W	X			X
US-1-D01N-GRWRE	SA	517790		W	X			X
MW-24-D01N-GRWRE	SA	517791		W	X			X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data validation was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

These analytical results in this package are the re-analyses of metals, sulfate, and for select samples, fluoride performed for groundwater samples collected in the Fall 2002 and December 2002.

The "RE" suffix was added to the field identification number for all samples to represent re-analyses.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Not Applicable	
Holding Times	No	The 28-day holding time for sulfate and fluoride were exceeded due to the samples being re-analyzed by a modified method to reduce matrix interferences present in the original analyses. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Antimony, and boron were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Not Applicable	This package did not include any site-specific matrix quality control samples. The matrix quality control results for each sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	Recoveries for internal standards Y and Tb were high for the ICPMS analysis of samples MMW-10B-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. For sample MW-4-T01N/D01N-GRWRE, the anion/cation balance was 25.05%, outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary for AC Balance.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank • Other (e.g., splits)	Not Applicable	
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. These reanalyses followed this dilution scheme. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Not Applicable	Package reviewed for sample-specific parameters only.
Initial/Continuing Calibration Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Laboratory Control Sample Results	Not Applicable	Package reviewed for sample-specific parameters only.
Compound Identification	Not Applicable	Package reviewed for sample-specific parameters only.
Quantification	Not Applicable	Package reviewed for sample-specific parameters only.
Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Not Applicable	Package reviewed for sample-specific parameters only.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Sulfate (mg/L)	Fluoride (mg/L)
MWB-T01N-GRWRE	180 J	---
MW-4-T01N-GRWRE	41.4 J	---
MW-15-T01N-GRWRE	1030 J	---
MMW-10B-T01N-GRWRE	1740 J	17.3 J
MMW-28A-T01N-GRWRE	423 J	---
US-2-T01N-GRWRE	295 J	---
EW-5B-T01N-GRWRE	808 J	---
US-1-T01N-GRWRE	73.6 J	---
MW-24-D01N-GRWRE	85.2 J	2.0 UJ

Table 1.2
Metal Blanks

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS) DF=2	1.5	1.4	1.5	7.5		0.3	MWB-D01N-GRWRE	U CCB-I
Boron (P) DF=1	8.3	5.3	4.5		5.744	2.7	EW-5B-D01N-GRWRE, MMW-10B-D01N-GRWRE, MMW-28A-D01N-GRWRE, MW-15-D01N-GRWRE, MW-24-D01N-GRWRE, MW-4-D01N-GRWRE, MWB-D01N-GRWRE, US-1-D01N-GRWRE, US-2-D01N-GRWRE	U CCB-I U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

MOLYCORP RI/FS
DATA VALIDATION REPORT
FOR THE
SPRING 2003 SURFACE WATER
SAMPLING EVENT DATA

Prepared for
Molycorp, Inc.
Questa, New Mexico

March 9, 2004

URS

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140148

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Summary of Reanalyses 2-1

Section 3 Data Review Process 3-1

Section 4 Data Review Commentary 4-1

4.1 Data Review Narratives 4-1
4.2 General Data Quality Issues 4-1
4.2.1 Dilution Schemes/Non-Detects With Elevated RLs 4-1
4.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses: 4-1
4.2.3 Non-Valid Matrix Spikes 4-2
4.2.4 Laboratory Performance Review (LPR) Findings 4-2

Section 5 Collective Summary/Assessment of Matrix QC Results 5-1

5.1 Matrix Spike Results (Accuracy Evaluation) 5-1
5.2 Laboratory Duplicate Results (Precision Evaluation) 5-3
5.3 Serial Dilution Results 5-4

Section 6 Collective Summary/Assessment of Field QC Results 6-1

6.1 Field Duplicate Results 6-1
6.2 Rinsate Blank Results 6-2
6.3 Field Blank Results 6-3

Section 7 Overall Data Quality Indicator Assessment 7-1

7.1 Precision 7-1
7.2 Accuracy 7-1
7.3 Completeness 7-1
7.4 Representativeness 7-1
7.5 Comparability 7-2
7.6 Sensitivity 7-2

TABLE OF CONTENTS

List of Attachments

Attachment 1.1	Data Review Summary for Data Package WAT057S
Attachment 1.2	Data Review Summary for Data Package WAT058S
Attachment 1.3	Data Review Summary for Data Package WAT059S
Attachment 1.4	Data Review Summary for Data Package WAT060S
Attachment 1.5	Data Review Summary for Data Package WAT061S
Attachment 1.6	Data Review Summary for Data Package WAT062S
Attachment 1.7	Data Review Summary for Data Package WAT063S
Attachment 1.8	Data Review Summary for Data Package WAT087C
Attachment 1.9	Data Review Summary for Data Package WATRAS1
Attachment 1.10	Data Review Summary for Data Package WATRAS2
Attachment 1.11	Data Review Summary for Data Package WATRAS3

This report contains the results of the data validation conducted for 55 surface water samples and associated quality control (QC) samples collected in during the Spring 2003 Surface Water sampling event as part of the Molycorp RI/FS.

The surface water samples were sent to STL Burlington, in Colchester, Vermont for metals and inorganic parameters analysis. The results were reported in eleven data packages (WAT057 thru WAT063, WAT087, WATRAS1, WATRAS2, WATRAS3). All samples were analyzed for total metals, dissolved metals, and inorganic parameters (aqueous media) as defined in the RI/FS QAPP. This data validation report describes the data validation process used and presents the data review results for the surface water and associated QC samples submitted to STL for chemical analysis. The field sample IDs and associated data package numbers are provided in table below.

Data Package	Field ID Recorded on COC[1]	QC Designation
WAT057S	RR-18A-T01N-SFW	
	RR-17-T01N-SFW	
	RR-18B-T01N-SFW	
	RR-16-T01N-SFW	
WAT058S	LR-5-T01N-SFW	SD
	LR-6-T01N-SFW	
	RR-6A-T01N-SFW	
	RR-7-T01N-SFW	
	RR-1-T01N-SFW	
	RR-3-T01N-SFW	
	LR-13-T01N-SFW	
	LR-16-T01N-SFW	
	RR-14-T01N-SFW	
	RR-14-T01D-SFW	FD to RR-14-T01N-SFW
WAT059S	RR-11B-T01N-SFW	
	LR-11A-T01N-SFW	
	ERLIN-T01N-SFW	MS,PDS,LD,SD
	ERLMID-T01N-SFW	
	RR-10-T01N-SFW	
	RR-13-T01N-SFW	
	LR-1-T01N-SFW	
	RR-11C-T01N-SFW	
	RR-8-T01N-SFW	
	RR-8A-T01N-SFW	
WAT060S	ONFH-T01N-SFW	
	RR-12-T01N-SFW	
	RR-11A1-T01N-SFW	MS,PDS,LD, SD
	ERLOUT-T01N-SFW	
	RR-5-T01N-SFW	
	RR-15-T01N-SFW	
	UNIQUE1-T01N-SFW	
	RR-10A1-T01N-SFW	
	RR-20-T01N-SFW	MS,PDS,LD, SD

Data Package	Field ID Recorded on COC[1]	QC Designation
WAT061S	RR-4-T01N-SFW	
	ZWERGEL-T01N-SFW	MS,PDS,LD,SD
	CD-1-T01N-SFW	
	RRS-18-T01N-SFW	
	RRS-9-T01N-SFW	
	RRS-23-T01N-SFW	
	RRS-23-T01D-SFW	FD to RRS-23-T01N-SFW
WAT062S	RRS-15-T01N-SFW	SD
	UNIQUE3-T01N-SFW	
	LR-8A-T01N-SFW	
	LR-8A-T01D-SFW	FD to LR-8A-T01N-SFW
	LR-4-T01N-SFW	
	UNIQUE2-T01N-SFW	
	RRS-12-T01N-SFW	
	RRS-13-T01N-SFW	
	RRS-20-T01N-SFW	
	RRS-27-T01N-SFW	
WAT063S	UCC-T01N-SFW	SD
WAT087C	UFLIN-T01N-SFW	
	UFLMID-T01N-SFW	
	UFLOUT-T01N-SFW	

FD = Field Duplicate MS = Matrix Spike

SD = Serial Dilution PDS = Post-Digestion Spike LD = Laboratory Duplicate

[1] "T01N" and "T01D" portion of the field ID were replaced with "D01N" and "D01D" respectively for the dissolved metals analyses.

Selected surface water samples reported in this package were reanalyzed for dissolved aluminum, dissolved arsenic, and dissolved cadmium without dilution in order to achieve lower reporting limits to meet project objectives. The results for the re-analysis were reported in three data packages: WATRAS1, WATRAS2, and WATRAS3. Each package was reviewed in accordance with SOP 12.1 and the results are reported in separate data review narrative summaries. In all cases, the results for the re-analysis were selected for reporting due to the lower limits attained. The hard copy data sheets for both the original analyses and reanalyses were annotated to indicate which results were selected for reporting.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate or spike duplicate analysis, post-digestion spike recoveries, ICP serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, rinsate blanks, field blanks, and trip blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1 and is as follows: if no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used; if no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used; if no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

In all cases of professional judgement exercised in evaluating the need for qualification, the basis for the professional judgement used is provided in the data review narrative. Section 4.0 provides the data review narratives for each of the data packages.

The site-specific matrix spike/matrix spike duplicate (MS/MSD) results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of

that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 5.0 provides the collective assessment of the matrix QC results (MS/MSD results, laboratory duplicate results, and serial dilution results) and associated sample qualification. Section 6.0 presents the collective summary of the field QC results (field and rinsate blanks and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 7.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

4.1 DATA REVIEW NARRATIVES

The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries, which are included in Attachment 1. The data qualifiers, reason codes, and bias codes were marked on the data sheets, which are retained in the project files. The data validation qualifiers reason codes and bias codes are also stored in the electronic database.

4.2 GENERAL DATA QUALITY ISSUES

During the data review process, several issues were identified which globally affected all relevant water samples analyzed for the Spring 2003 Surface Water event. Although these issues may have been addressed in the individual data review summary reports, it was considered necessary to summarize them this data validation report.

4.2.1 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

During the project, the need to analyze all surface water samples without dilution, regardless of pH, was identified. As such, surface water samples were generally analyzed without dilution, unless dilution was necessary based on analyte concentrations present in the sample.

4.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses:

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgement, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the analyses. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not considered an appropriate measure for assessing accuracy of the analysis.

4.2.3 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

4.2.4 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 3.0. STL data package WAT063S was used to evaluate laboratory performance criteria. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. As a result of the LPR, the following parameters were evaluated for each package:

- Continuing Calibration Verification (CCV) results were reviewed in all metal results. No additional data qualification resulted, as all were either within the acceptance recovery range of 90-110% or were not applicable to any of the samples in the sequence run.
- Initial Calibration Verification (ICV) results were reviewed and no additional data qualification resulted.

The site-specific matrix spike (MS) results, laboratory duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analysis, LD analyses, and the serial dilution results for the samples collected during the sampling event.

5.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

The table below illustrates the site-samples that were used to prepare matrix spike samples. As four matrix spikes were prepared and analyzed for metals, dissolved metals and inorganic parameters for 55 field sample sites (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
ERLIN-T01N-SFW	Surface Water	WAT059S	Metals and Inorganic Parameters
ERLIN-D01N-SFW	Surface Water	WAT059S	Dissolved Metals
RR-11A1-T01N-SFW	Surface Water	WAT060S	Metals and Inorganic Parameters
RR-11A1-D01N-SFW	Surface Water	WAT060S	Dissolved Metals
RR-20-T01N-SFW	Surface Water	WAT060S	Metals and Inorganic Parameters
RR-20-D01N-SFW	Surface Water	WAT060S	Dissolved Metals
ZWERGEL-T01N-SFW	Surface Water	WAT061S	Metals and Inorganic Parameters
ZWERGEL-D01N-SFW	Surface Water	WAT061S	Dissolved Metals

A number of spike recoveries were outside of the QC acceptance limits of 75%-125%. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the magnitude of outages, and the number of valid spike recoveries relative tot he size of the sample set.

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the matrix spike results that were outside of acceptance limits were caused by the sample matrix, a bias in the analytical system, or a combination of both. Recoveries for nearly all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

The table below summarizes the results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Analyte	Total				Dissolved				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Aluminum	4	0	0	110.3	4	0	0	110.0	None
Antimony	4	0	0	101.5	4	0	0	102.4	None
Arsenic	4	0	0	106.8	4	0	0	100.1	None
Barium	4	0	0	108.1	4	0	0	107.7	None
Beryllium	4	0	0	107.4	4	0	0	106.3	None
Boron	4	0	0	106.3	4	0	0	105.3	None
Cadmium	4	0	0	107.6	4	0	0	106.8	None
Chromium	4	0	0	107.8	4	0	0	107.4	None
Cobalt	4	0	0	107.6	4	0	0	106.7	None
Copper	4	0	0	109.0	4	0	0	108.0	None
Iron	4	0	1	106.5	4	1	0	92.3	J MS-L for parent sample only (ERLIN-D01N-SFW). No qualification for parent sample with elevated %R (ERLIN-T01N-SFW) because non-detect sample result.
Lead	4	0	0	110.5	4	0	0	105.9	None
Manganese	4	0	0	104.6	4	0	0	103.3	None
Mercury	4	0	0	106.3	4	0	0	105.8	None
Molybdenum	4	0	0	104.1	4	0	0	105.5	None
Selenium	4	0	0	106.9	4	0	0	89.7	None
Nickel	4	0	0	109.7	4	0	0	109.2	None
Silver	4	0	0	108.8	4	0	0	107.9	None
Thallium	4	0	0	109.9	4	0	0	109.7	None
Vanadium	4	0	0	105.4	4	0	0	104.2	None
Zinc	4	0	0	106.2	4	0	0	105.4	None
Cyanide	4	0	0	89.8	NA				None
Chloride	4	0	0	102.2					None
Nitrate	4	0	0	102.5					None
Bicarbonate Alkalinity	4	2	0	54.4[1]					None. Refer to Section 3.2.6.
Total Alkalinity	4	0	0	108.8					None
Fluoride	4	0	0	105.6					None
Ammonia	4	2	0	72.6					J/UJ MS-L for all samples.
TKN	4	0	0	97.5					None
Nitrite	4	0	0	98.3					None
Orthophosphate	4	1	0	84.0					J MS-L for parent sample only (RR-11A1-T01N-SFW).
Phosphorus	4	0	0	102.0					None
Sulfate	4	0	0	80.6					None
BOD	4	0	0	100.9					None
COD	4	0	0	106.9					None
TOC	4	0	0	101.7					None

[1] Two of four results had 0% recovery. Average excluding 0% recoveries is 108.7% R.

With the exceptions of ammonia, data qualification was limited to parent samples only. For ammonia, because the average percent recovery and 2 of 4 (50%) results were outside of QC

acceptance limits, matrix spike qualification was applied to all samples. Although bicarbonate alkalinity exhibited 2 of 4 valid spike results (50%) outside QC acceptance limits, data qualification was not issued due to matrix effects mentioned earlier in Section 3.2.6.

5.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

The table below illustrates the site-samples that were used to prepare laboratory duplicate samples. As four laboratory duplicates were prepared and analyzed for inorganic parameters, metals and dissolved metals on 55 field sample sites (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
ERLIN-T01N-SFW	Surface Water	WAT059S	Metals and Inorganic Parameters
ERLIN-D01N-SFW	Surface Water	WAT059S	Dissolved Metals
RR-11A1-T01N-SFW	Surface Water	WAT060S	Metals and Inorganic Parameters
RR-11A1-D01N-SFW	Surface Water	WAT060S	Dissolved Metals
RR-20-T01N-SFW	Surface Water	WAT060S	Metals and Inorganic Parameters
RR-20-D01N-SFW	Surface Water	WAT060S	Dissolved Metals
ZWERGEL-T01N-SFW	Surface Water	WAT061S	Metals and Inorganic Parameters
ZWERGEL-D01N-SFW	Surface Water	WAT061S	Dissolved Metals

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤20% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL. For metals data, the CRDL is used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL and the IDL was considered to be too low to be used as the baseline for these concentration dependent evaluations.

With three exceptions, the relative percent differences (RPDs) or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within QAPP acceptance limits. The exceptions and the resultant data qualifiers are summarized in the table below.

Analyte	Sample ID	Criterion	Criterion Exceedance	Action
Orthophosphate	RR-11A1-T01N-SFW	RPD < 20%	46%	J D-I for parent sample only.
Phosphorous	RR-11A1-T01N-SFW	RPD < 20%	22%	J D-I for parent sample only.
TOC	ZWERGEL-T01N-SFW	$\lvert$Diff$\rvert$ <RL	1.1xRL	UJ D-I for parent sample only.

Qualification was limited to parent samples because only a quarter of the laboratory duplicate results for a given analyte were outside of the QC acceptance range and the individual exceedances were relatively low.

5.3 SERIAL DILUTION RESULTS

Serial dilution tests involve the analysis of a sample and a five-fold dilution of the same sample. When analyte concentrations are sufficiently high (i.e., greater that 50x the instrument detection limit [IDL]), the original result and diluted sample result are expected to be fairly comparable. If the results are not comparable, it is generally assumed that there are matrix interferences that are resulting in the suppression of elevation of the signal for one or more analytes.

The original and diluted sample results are compared by a percent difference (%D). When %Ds <10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate that the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result. As illustrated by the table below, serial dilution tests were conduced on four surface water sample sets, with an additional three samples having serial dilution tests performed on only the total metals fraction of the sample.

Sample ID	Matrix	Data Package	Analyses
LR-5-T01N-SFW	Surface Water	WAT058S	Metals
ERLIN-T01N-SFW	Surface Water	WAT059S	Metals
ERLIN-D01N-SFW	Surface Water	WAT059S	Dissolved Metals
RR-11A1-T01N-SFW	Surface Water	WAT060S	Metals
RR-11A1-D01N-SFW	Surface Water	WAT060S	Dissolved Metals
RR-20-T01N-SFW	Surface Water	WAT060S	Metals
RR-20-D01N-SFW	Surface Water	WAT060S	Dissolved Metals
ZWERGEL-T01N-SFW	Surface Water	WAT061S	Metals
ZWERGEL-D01N-SFW	Surface Water	WAT061S	Dissolved Metals
RRS-15-T01N-SFW	Surface Water	WAT062S	Metals
UCC-T01N-SFW	Surface Water	WAT063S	Metals

All serial dilution analyses performed were not applicable because native sample concentrations were ≤50 times the IDL. As the sample matrix was surface water, this was not particularly unexpected. Consequently, the serial dilution results could not be used to assess potential matrix interferences.

The site-specific blanks (field and rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

6.1 FIELD DUPLICATE RESULTS

The table below presents the field duplicates collected for this event. As three field duplicate sample pairs were prepared and analyzed for metals, dissolved metals and inorganic parameters for 55 field sample sites (excluding the field duplicate samples), the QAPP frequency for field duplicate QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
RR-14-T01D-SFW	Surface Water	WAT058S	Metals and Inorganic Parameters
RR-14-D01D-SFW	Surface Water	WAT058S	Dissolved Metals
RRS-23-T01D-SFW	Surface Water	WAT061S	Metals and Inorganic Parameters
RRS-23-D01D-SFW	Surface Water	WAT061S	Dissolved Metals
LR-8A-T01D-SFW	Surface Water	WAT062S	Metals and Inorganic Parameters
LR-8A-D01D-SFW	Surface Water	WAT062S	Dissolved Metals

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤30% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For field duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than two times the greater RL. For metals data, the CRDL is used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL and the IDL was considered to be too low to be used as the baseline for these concentration dependent evaluations. With three exceptions, the applicable evaluation criterion was met. The exceptions and the resultant data qualifiers are summarized in the table below.

Analyte	Sample ID	Criterion	Criterion Exceedance	Action
Orthophosphate	RR-14-T01N/T01D-SFW	$\lvert$Diff$\rvert$ <2xRL	65xRL	J FD-I for parent samples only.
	LR-8A-T01N/T01D-SFW	$\lvert$Diff$\rvert$ <2xRL	44xRL	J FD-I for parent samples only.
Phosphorous	RR-14-T01N/T01D-SFW	$\lvert$Diff$\rvert$ <2xRL	3.3xRL	J FD-I for parent samples only.

Qualification was limited to parent samples only. For phosphorous, only 1 of 3 results were outside QC acceptance limits and the exceedance was relatively small (3.3xRL). Although 2 of 3 results for orthophosphate results were outside QC acceptance limits, qualification was limited only to the parent sample because both field duplicate sets had an orthophosphate/phosphorous total versus partial disagreement which may have resulted in the field duplicate disagreement.

6.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. The rinsate blanks were given field IDs of RB01T/RB01D-SFW through RB04T/RB04D-SFW. As four rinsate blanks were prepared and analyzed for metals, dissolved metals and inorganic parameters for 55 field sampling sites, the QAPP frequency for rinsate blank QC samples (5%) was satisfied.

The rinsate blank detections results and the resulting data qualification issued is summarized in the following table. To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result or biasing the average high by using the reporting limit.

Analyte	Sample ID	Conc.	RL	Frequency of Detection	Average RB Concentration	Range for Field Samples	Number of Samples Qualified	Action
Total Metals (µg/L)								
Chromium	RB02T-SFW	1.0	1.0	1 of 4	0.63	1 to 3.7	20	U RB-I for all sample results ≤3.1 µg/L
Selenium	RB02T-SFW	3.9	1.0	1 of 4	2.0	1 to 4.5	33	U RB-I for all sample results ≤9.9 µg/L
Zinc	RB04T-SFW	16.1	14.0	1 of 4	12.4	17.3 to 254	18	U RB-I for all sample results ≤62 µg/L
Inorganic Parameters (mg/L)								
Ammonia	RB01T-SFW	0.1	0.04	4 of 4	0.08	0.05 to 0.31	43	U RB-I for all sample results ≤0.4 mg/L
	RB02T-SFW	0.1						
	RB03T-SFW	0.05						
	RB04T-SFW	0.08						
Bicarbonate Alkalinity	RB01T-SFW	2.8	1.0	4 of 4	2.8	40.9 to 146	0	U RB-I for all sample results ≤13.9 mg/L
	RB02T-SFW	2.9						
	RB03T-SFW	2.6						
	RB04T-SFW	2.8						
Phosphorous	RB01T-SFW	0.02	0.01	1 of 4	0.01	0.01 to 0.14	18	U RB-I for all sample results ≤0.039 mg/L
Total Alkalinity	RB01T-SFW	2.8	1.0	4 of 4	2.8	40.9 to 146	0	U RB-I for all sample results ≤13.9 mg/L
	RB02T-SFW	2.9						
	RB03T-SFW	2.6						
	RB04T-SFW	2.8						
Total Dissolved Solids	RB01T-SFW	18	10	4 of 4	28.5	88 to 568	10	U RB-I for all sample results ≤142.5 mg/L
	RB02T-SFW	40						
	RB03T-SFW	32						
	RB04T-SFW	24						
Total Suspended Solids	RB04T-SFW	1.1	0.5	1 of 4	0.46	0.5 to 56.4	8	U RB-I for all sample results ≤2.3 mg/L

In calculating the average rinsate blank concentration, one half of the RL was used for nondetect results.

While some results were qualified as non-detect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and at relatively low levels.

6.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field blanks are only required by the QAPP when samples are analyzed for organics. Therefore, no field blanks were collected in association with the surface water samples collected during this sample event.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as estimated on the basis of the MS/MSD results, serial dilution results, field duplicate results, or holding time exceedances. A general overall assessment of each of the QAPP's data quality assurance objectives is provided below.

7.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

Approximately 98% of the field duplicate and laboratory results satisfied the applicable criteria. As such, the overall level of precision demonstrated is considered to be acceptable.

7.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of LCSs and MS/MSDs.

All of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP, which is considered to be indicative of acceptable overall accuracy with respect to the analytical system.

The matrix spike recoveries suggested that the overall accuracy attained with respect to the site-specific sample matrix is satisfactory as 97% of the matrix spike recoveries were within the QAPP acceptance range of 75-125%. Sample results were qualified accordingly as estimated due to low or high matrix spike recoveries.

7.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results for the 58 samples analyzed (55 field samples and 3 field duplicates) are considered usable as qualified for meeting project objective. As such, the completeness for the samples analyzed is 100%, which satisfies the QAPP completeness goal of 80%.

7.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the surface water samples. The close agreement between the field duplicate results (98%) is considered to indicate that the samples collected are adequately representative of the medium sampled. Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. As noted in Section 6.1, 98% of the laboratory duplicate results satisfied the precision evaluation indicating that sample processing and subsampling procedures were acceptable.

7.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

7.6 SENSITIVITY

All RLs obtained, except for three aluminum results and all cadmium, cyanide and boron results, met the QAPP specified RL requirements for aqueous media for which there was screening level criteria provided in the QAPP or the Baseline Ecological Risk Assessment to which RLs for nondetect analytes could be compared.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT057C

Sampling Event: Spring 2003 SW/SED

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 04/30/03

Peer Reviewer: Stacey Coker

Date Completed: 05/01/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses					
					Metals	Inorganics	BOD	COD	pH	Conductivity
RB01T-SED	RB	519745		W	X	X				
RB02T-SED	RB	519746		W	X	X				
RB05T-SED	RB	519747		W	X	X				
RB06T-SED	RB	519748		W	X	X				
RR-18A-T01N-SFW	SA	519959		W	X	X	X	X	X	X
RR-18A-D01N-SFW	SA	519958		W	X					
RR-17-T01N-SFW	SA	519959		W	X	X	X	X	X	X
RR-17-D01N-SFW	SA	519960		W	X					
RR-18B-T01N-SFW	SA	519961		W	X	X	X	X	X	X
RR-18B-D01N-SFW	SA	519962		W	X					
RR-16-T01N-SFW	SA	519962		W	X	X	X	X	X	X
RR-16-D01N-SFW	SA	519964		W	X					
RB03T-SED	RB	519965		W	X	X				
RB04T-SED	RB	519966		W	X	X				
RB07T-SED	RB	519967		W	X	X				
RB08T-SED	RB	519968		W	X	X				

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

Selected surface water samples reported in this package were reanalyzed for dissolved aluminum, dissolved arsenic, and dissolved cadmium without dilution in order to achieve lower reporting limits to meet project objectives. The results for the re-analysis were reported in three data packages: WATRAS1, WATRAS2, and WATRAS3. Each package was reviewed in accordance with SOP 12.1. The results of the review are reported in separate data review narrative summaries. In all cases, the results for the re-analysis have been annotated to indicate which results were selected for reporting. The associated Data Validation Report for each sampling event affected contains further details.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The chain of custody for samples RR-18A-T01N-SFW, RR-17-T01N-SFW, RR-18B-T01N-SFW, and RR-16-T01N-SFW did not include the request for pH or conductivity analyses. Per the client's request, via a facsimile from Stacey Coker (URS) to Don Dawicki (STL-Burlington), dated 03/20/03, pH and conductivity analysis parameters were added for these four surface water samples. In addition, the fax noted the same four samples were in pH class C. No qualification of data was necessary on the basis of chain of custody or sample receipt.
Holding Times	No	Several nitrite, orthophosphate, and BOD_5 samples were run several hours beyond the 48-hour holding time. The Total Dissolved Solids (TDS) analysis for two samples was run 28 days beyond the prescribed analytical holding time of 7 days. For these two samples, the initial analyses were voided because the calculated versus measure TDS ratios were outside acceptance limits. The results for the reanalyses yielded acceptable ratios. As such, the results for the reanalyses are considered to be of higher quality despite the exceeded holding time. The QAPP holding time specifications for the measurements of conductivity and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 16 days after sampling and 14 days beyond log-in. The pH for all samples was measured 8 hours after log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Nitrogen in the form of ammonia was detected in the inorganics method blank sample BLKNH0402C run on 04/02/03 at a concentration of 0.075 mg/L. All samples in this delivery group were run on 04/02/03 and therefore were associated with this blank. Ammonia-nitrogen results for all samples in this data package were less than five times the equivalent blank concentration and were accordingly qualified as nondetect with an indeterminate direction of bias. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD • PDS • LD	No	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the March 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) RB01T-SEDL • Total vs. Partial Analyses • Cation/Anion Balance • TDS	No	The serial dilution analysis on sample RB01T-SED was not applicable for all 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL, (adjusted for dilution). It was therefore not necessary to qualify any results on the basis of serial dilutions. The orthophosphate concentration of 0.16 mg/L in sample RR-18A-T01N-SFW was greater than the corresponding total phosphorus concentration of 0.040 mg/L. Due to the fact that neither partial nor total concentration exceeded 5x the RL (0.010), the absolute difference between the partial and total results were compared to an evaluation criterion of ±2x RL. Accordingly, the orthophosphate and phosphorus results for sample RR-18A-T01N-SFW were qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion and subsequently did not require data qualification. The laboratory case narrative noted the calculated versus measured TDS ratios for samples RR-18B and RR-16 were significantly discrepant. Therefore, the laboratory reanalyzed these two samples outside of holding time, resulting in ratios of 1.14 and 1.09, respectively. The ratios for all other samples fell within the acceptance range of 0.5 to 1.5. No qualification of data was necessary on the basis of TDS ratios.
Field QC • Field Duplicate • Rinsate Blank RB-01T-SED RB02T-SED RB03T-SED RB04T-SED RB05T-SED RB06T-SED RB07T-SED RB08T-SED • Field Blank • Trip Blank		Table 1.3 summarizes the results for six of the eight rinsate blanks which were included in this package and associated with sediment samples not in this data package. RB04T-SED and RB05T-SED results were all nondetect for all analytes. The Field QC results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrite	Ortho-P	BOD_5	TDS	Cond.	pH
RR-18A-T01N-SFW	---	---	1.5 UJ	---	355 J	7.4 J
RR-17-T01N-SFW	---	---	1.5 UJ	---	365 J	7.4 J
RR-18B-T01N-SFW	0.10 J	0.010	1.5 UJ	269 J	354 J	7.4 J
RR-16-T01N-SFW	---	---	---	269 J	269 J	7.4 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (MS)	0.5	0.4	0.4	---	---	---	0.60	RB01T-SED	U CCB-I
Iron (P)	53.0	---	47.2	---	---	---	42.2	RB02T-SED RR-17-D01N-SFW RR-18A-T01N-SFW RR-18B-D01N-SFW RR-18B-T01N-SFW	U CCB-I
Manganese (P)	---	---	---	-2.2	---	-1.368	1.3	RB01T-SED RB02T-SED RB03T-SED RB04T-SED RB05T-SED RB06T-SED RB07T-SED RB08T-SED	J MB-L or UJ MB-L
Nickel (P)	---	---	---	---	---	-3.293	3.0	None of the nickel results were reported from ICAP 5, where the method blank detection occurred.	---
Sodium (P)	---	---	---	---	---	1882.0	916.3	RR-16-D01N-SFW RR-16-T01N-SFW RR-17-D01N-SFW RR-18A-D01N-SFW RR-18A-T01N-SFW RR-18B-D01N-SFW RR-18B-T01N-SFW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Rinsate Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB01T-SED	03/18/03	Total Phosphorus Copper Lead Manganese	0.12 0.0026 0.00024 0.0258	0.010 0.0015 0.00010 0.0013
RB02T-SED	03/18/03	Chromium Copper Manganese	0.001 0.0015 0.0020	0.001 0.0015 0.0013
RB05T-SED	03/18/03	Total Kjeldahl Nitrogen	0.37	0.240
RB06T-SED	03/18/03	Beryllium Chromium	0.00034 0.0012	0.0003 0.001
RB07T-SED	03/19/03	Total Phosphorus	0.041	0.010
RB08T-SED	03/19/03	Chromium	0.0013	0.001

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT058C

Sampling Event: Spring 2003 SW/SED

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 04/28/03

Peer Reviewer: Stacey Coker

Date Completed: 05/01/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses					
					Metals	Inorganics	BOD	COD	pH	Conductivity
LR-5-T01N-SFW	SA	520106		W	X	X	X	X	X	X
LR-5-D01N-SFW	SA	520107		W	X					
RR-6-T01N-SFW	SA	520108		W	X	X	X	X	X	X
RR-6-D01N-SFW	SA	520109		W	X					
RR-6A-T01N-SFW	SA	520110		W	X	X	X	X	X	X
RR-6A-D01N-SFW	SA	520111		W	X					
RR-7-T01N-SFW	SA	520112		W	X	X	X	X	X	X
RR-7-D01N-SFW	SA	520113		W	X					
RR-1-T01N-SFW	SA	520114		W	X	X	X	X	X	X
RR-1-D01N-SFW	SA	520115		W	X					
RR-3-T01N-SFW	SA	520116		W	X	X	X	X	X	X
RR-3-D01N-SFW	SA	520117		W	X					
LR-13-T01N-SFW	SA	520118		W	X	X	X	X	X	X
LR-13-D01N-SFW	SA	520119		W	X					
LR-16-T01N-SFW	SA	520120		W	X	X	X	X	X	X
LR-16-D01N-SFW	SA	520121		W	X					
RR-14-T01N-SFW	SA	520122		W	X	X	X	X	X	X
RR-14-D01N-SFW	SA	520123		W	X					
RR-14-T01D-SFW	FD	520124		W	X	X	X	X	X	X
RR-14-D01D-SFW	FD	520125		W	X					

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory noted the Total Organic Carbon (TOC) analysis by method 9060 of sample RR-14-T01D-SFW (lab id 520124) was bracketed by a calibration verification standard that yielded a marginally increased response. The laboratory also noted sample RR-14-T01D-SFW did not exhibit the presence of carbon above the URS reporting limit. Upon review of the raw data sheets, it was verified that the continuing calibration verification run on 03/28/03 at 00:34:52 recovered the standard at 113%, (outside the acceptance range of 90-110%). This sample detected a TOC concentration of 2.145 mg/L, which is above the laboratory's reporting limit of 1.0 mg/L. Table B.4.4-2a of the QAPP specifies a maximum allowable RL of 10 mg/L for TOC, but does not specify other RL limits or requirements. The TOC result for RR-14-T01D-SFW was qualified as estimated (J) with a high bias direction.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

Selected surface water samples reported in this package were reanalyzed for dissolved aluminum, dissolved arsenic, and dissolved cadmium without dilution in order to achieve lower reporting limits to meet project objectives. The results for the re-analysis were reported in three data packages: WATRAS1, WATRAS2, and WATRAS3. Each package was reviewed in accordance with SOP 12.1. The results of the review are reported in separate data review narrative summaries. In all cases, the results for the re-analysis have been annotated to indicate which results were selected for reporting. The associated Data Validation Report for each sampling event affected contains further details.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The "SFW" at the end of the sample id for samples RR-6A-T/D01N-SFW and RR-7-T/D01N-SFW was omitted on the COC. These four samples were logged in under the correct id, as was listed on the container labels. Upon sample receipt and log-in, a discrepancy between the laboratory COC and sample labels was identified. The collection date for samples LR-5-T/D01N-SFW, LR-6-T/D01N-SFW, RR-6A-T/D01N-SFW, RR-7-T/D01N-SFW, RR-1-T/D01N-SFW and RR-3-T/D01N-SRW recorded on the laboratory COC form was 03-21-03. However, the sample labels indicated that the samples were collected on 03-20-03. After reviewing the date and time of relinquishment recorded on the laboratory COC, it was determined that the sample labels were correct. As such, the samples were logged in according to the sample collection date on the sample labels.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Holding Times	No	The 48-hour holding times for nitrate, nitrite, orthophosphate, and BOD_5 were exceeded by several hours. Accordingly, all results for these four analytes for all samples were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of conductivity and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 15 days after sampling and 13 days beyond log-in. The pH for all samples was measured 8 hours after log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Nitrogen in the form of ammonia was detected at a concentration of 0.075 mg/L in the inorganics method blank sample BLKNH0402C run on 04/02/03. The ammonia-nitrogen analyses in samples LR-5-T01N-SFW and RR-6-T01N-SFW were run on 04/02/03 and therefore were associated with this blank. Ammonia-nitrogen results for both samples were less than five times the equivalent blank concentration and were accordingly qualified as nondetect with an indeterminate direction of bias. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.
Matrix QC • MS/MSD • PDS • LD	No	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the March 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) LR-5-T01N-SFWL • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample LR-5-T01N-SFW was not applicable for all 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL, (adjusted for dilution). It was therefore not necessary to qualify any results on the basis of serial dilutions. The orthophosphate concentrations in seven samples reported concentrations in excess of the associated total phosphorus concentrations and were accordingly qualified as estimated (J/UJ) with an indeterminate bias direction. Table 1.3 summarizes the results qualified on the basis of total versus partial review. The criteria used to evaluate the need for qualification of this data was referenced from the SOP 12.1. When the concentrations for both orthophosphate and total phosphorus are greater than 5x the RL (highest), the percent difference between the two values is compared to an evaluation criterion of 30%. If one or both of the concentrations did not exceed 5x the RL, the absolute difference between the two values was compared to an evaluation criterion of 2x RL (highest). Table 1.3 summarizes the orthophosphate and total phosphorus results qualified on the basis of total vs. partial criteria. The iron concentration of 7650 µg/L in the filtrate (dissolved) sample RR-3-D01N-SFW was greater than the iron concentration of 2870 µg/L in the corresponding total metals sample, RR-3-T01N-SFW. Due to the fact that both values are greater than 5x the RL (adjusted for a dilution factor of 10 = 422 g/L), the percent difference between the two results is compared to an evaluation criterion of 30%. The partial concentration is 266.5% greater than the total concentration. Accordingly, the iron results for both samples were qualified as estimated (J) with an indeterminate direction of bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion and subsequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5, with the exception of samples RR-1-T/D01N-SFW and RR-3-T/D01N-SFW; which reported TDS ratios of 1.56 for all four samples. Due to the fact the TDS calculated was greater than the TDS measured, the TDS results for these four samples was qualified as estimated (J) with a low bias direction.
Field QC • Field Duplicate RR-14-D01N/D-SFW RR-14-T01N/D-SFW • Rinsate Blank • Field Blank • Trip Blank	N/A	All results for these field duplicate pairs satisfied the evaluation criteria in the QAPP except for orthophosphate and phosphorus. Table 1.4 summarizes the qualifications based on outlying field duplicate recoveries. The Field QC results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	BOD_5	Cond.	pH
LR-5-T01N-SFW	0.63 J	0.0094 J	0.12 J	1.5 UJ	367 J	7.9 J
RR-6-T01N-SFW	0.74 J	0.031 J	0.84 J	1.3 J	296 J	7.8 J
RR-6A-T01N-SFW	0.53 J	0.013 J	0.31 J	1.5 UJ	286 J	7.8J
RR-7-T01N-SFW	0.55 J	0.014 J	0.99 J	1.5 UJ	293 J	7.8 J
RR-1-T01N-SFW	0.40 UJ	0.0050 UJ	0.13 J	1.5 UJ	194 J	7.9 J
RR-3-T01N-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	1.5 UJ	236 J	7.7J
LR-13-T01N-SFW	0.57 J	0.0070 J	0.010 UJ	1.5 UJ	451 J	7.9 J
LR-16-T01N-SFW	0.51 J	0.0074 J	0.48 J	1.5 UJ	451 J	8.0 J
RR-14-T01N-SFW	0.69 J	0.012 J	0.66 J	1.5 UJ	387 J	7.7 J
RR-14-T01D-SFW	0.71 J	0.011 J	0.010 UJ	1.5 UJ	382 J	7.7 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P)	---	---	---	68.8	---	---	42.6	RR-14-T01D/N-SFW	U CCB-I
Antimony (MS)	---	---	---	0.3	---	---	0.3	NONE	---
Arsenic (MS)	---	---	-0.3	---	---	---	0.2	All samples with the **exception** of: LR-5-T/D01N-SFW LR-6-T/D01N-SFW RR-6A-T/D01N-SFW	J CCB-L or UJ CCB-L
Cadmium (P)	---	---	-0.5	---	---	---	0.5	All samples with the **exception** of: LR-5-T/D01N-SFW LR-6-T/D01N-SFW RR-6A-T/D01N-SFW	UJ CCB-L
Mercury (CV)	---	-0.1	---	---	---	---	0.1	All samples with the **exception** of: LR-16-D01N-SFW RR-14-D01D/N-SFW RR-14-T01D/N-SFW	UJ CCB-L
Selenium (MS)	0.6	---	-1.1	0.8	---	---	0.5	All samples with the **exception** of: LR-5-T/D01N-SFW LR-6-T/D01N-SFW RR-6A-T/D01N-SFW	J CCB-L or UJ CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Data Qualifications

Sample	Ortho-Phos. (mg/L)	Total Phosph. (mg/L)	Criteria	Qualification Code
LR-5-T01N-SFW	0.12	0.033	|Diff| >2xRL	J TvP-I Or UJ TvP-I
RR-6-T01N-SFW	0.84	0.14		
RR-6A-T01N-SFW	0.31	0.073	>30%	
RR-7-T01N-SFW	0.99	0.079	|Diff| >2xRL	
RR-1-T01N-SFW	0.13	0.010		
LR-16-T01N-SFW	0.48	0.027		
RR-14-T01N-SFW	0.66	0.022		

Table 1.4
Field Duplicate Data Qualifications

Sample ID	Analyte	RPD or Difference	Action
RR-14-T01N/D-SFW	Orthophosphate	65xRL	J/UJ FD-I
RR-14-T01N/D-SFW	Phosphorus	3.3xRL	J/UJ FD-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT059C

Sampling Event: March 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 05/05/03

Peer Reviewer: Alan Roberts

Date Completed: 05/09/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Inorganics	BOD	COD	pH	Conductivity
RR-11B-T01N-SFW	SA	520138		W	X	X			X
RR-11B-D01N-SFW	SA	520139		W	X				
LR-11A-T01N-SFW	SA	520140		W	X	X			X
LR-11A-D01N-SFW	SA	520141		W	X				
ERLIN-T01N-SFW	SA	520142		W	X	X			X
ERLIN-D01N-SFW	SA	520143		W	X				
ERLMID-T01N-SFW	SA	520144		W	X	X			X
ERLMID-D01N-SFW	SA	520145		W	X				
RR-10-T01N-SFW	SA	520146		W	X	X			X
RR-10-D01N-SFW	SA	520147		W	X				
RR-13-T01N-SFW	SA	520148		W	X	X			X
RR-13-D01N-SFW	SA	520149		W	X				
LR-1-T01N-SFW	SA	520150		W	X	X			X
LR-1-D01N-SFW	SA	520151		W	X				
RR-11C-T01N-SFW	SA	520152		W	X	X			X
RR-11C-D01N-SFW	SA	520153		W	X				
RR-8-T01N-SFW	SA	520154		W	X	X			X
RR-8-D01N-SFW	SA	520155		W	X				
RR-8A-T01N-SFW	SA	520156		W	X	X			X
RR-8A-D01N-SFW	SA	520157		W	X				

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The ammonia analysis of the laboratory control sample yielded a percent recovery of 242%, which is double the expected value. The high recovery is likely due to the blank inadvertently being spiked with twice the normal amount of spiking solution. The other blank spike analysis associated with this analytical sequence exhibited acceptable recoveries. The association field samples were reported from the acceptable analytical sequence, therefore no qualification was necessary.

The metals analyses in this SDG were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of samples, which were determined by the field pH determinations.

Selected surface water samples reported in this package were reanalyzed for dissolved aluminum, dissolved arsenic, and dissolved cadmium without dilution in order to achieve lower reporting limits to meet project objectives. The results for the re-analysis were reported in three data packages: WATRAS1, WATRAS2, and WATRAS3. Each package was reviewed in accordance with SOP 12.1. The results of the review are reported in separate data review narrative summaries. In all cases, the results for the re-analysis have been annotated to indicate which results were selected for reporting. The associated Data Validation Report for each sampling event affected contains further details.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, orthophosphate, BOD, and pH. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, and beryllium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS ERLIN-T01N-SFW ERLIN-D01N-SFW • LD ERLIN-T01N-SFW ERLIN-D01N-SFW	No	The matrix spike (MS) percent recovery for some analytes was out of limits in sample ERLIN-T01N-GRW and ERLIN-D01N-SFW. Table 1.3 summarizes these MS results. The MS results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent samples were qualified on the basis of MS results per SOP 12.1.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution ERLIN-T01N-SFW ERLIN-D01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance RR-11B-T01N/D01N-SFW	No	The serial dilution analyses on sample ERLIN-T01N-SFW, pH class B, (generally for trace ICP metals) was applicable for 0 out of 24 analytes For sample RR-11B-T01N/D01N-SFW, the anion/cation balance was 13.52%, outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary for AC Balance.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)	BOD (mg/L)	pH (mg/L)
RR-11B-T01N-SFW	0.71 J	0.015 J	0.044 J	1.5 UJ	7.6 J
LR-11A-T01N-SFW	0.62 J	0.0098 J	0.010 J	1.5 UJ	7.5 J
RR-10-T01N-SFW	0.77 J	0.023 J	0.072 J	1.2 J	7.6 J
RR-13-T01N-SFW	0.54 J	0.008 J	0.010 UJ	1.4 UJ	7.6 J
LR-1-T01N-SFW	0.60 J	0.0079 J	0.010 UJ	1.4 UJ	7.7 J
RR-11C-T01N-SFW	0.52 J	0.0085 J	0.010 UJ	1.4 UJ	7.5 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=10	82.1					42.6	ERLIN-T01N-SFW, ERMID-T01N-SFW, LR-11A-T01N-SFW, LR-1-T01N-SFW, RR-10-T01N-SFW, RR-11B-T01N-SFW, RR-11C-T01N-SFW, RR-13-T01N-SFW, RR-8A-T01N-SFW, RR-8A-D01N-SFW, RR-8-T01N-SFW	U CCB-I
Antimony (P) DF=2	1.5	1.4	1.3	1.3	1.373	0.3	ERLMID-T01N-SFW, RR-11B-T01N-SFW, RR-13-T01N-SFW	U CCB-I U MB-I
Beryllium (P) DF=1	-0.4		-0.3		-0.357	0.3	ERLIN-T01N-SFW, ERLIN-D01N-SFW, ERLMID-T01N-SFW, LR-11A-D01N-SFW, LR-1-T01N-SFW, LR-1-D01N-SFW, RR-10-T01N-SFW, RR-10-D01N-SFW, RR-11B-T01N-SFW, RR-11B-D01N-SFW, RR-11C-D01N-SFW, RR-13-D01N-SFW, RR-8A-T01N-SFW, RR-8A-D01N-SFW, RR-8-T01N-SFW, RR-8-D01N-SFW, ERLMID-T01N-SFW, ERLMID-D01N-SFW, LR-11A-T01N-SFW, RR-11C-T01N-SFW, RR-13-T01N-SFW	J/UJ CCB-L J/UJ MB-L

Table 1.3
Matrix Spike Recovery Not Meeting Criteria

Sample/Analytes	Matrix Spike Recovery	Acceptance Limits	Action
ERLIN-T01N-SFW			
Ammonia	61.2%	75-125%	Qualify parent sample J MS-L
Iron	128.4%		Nondetect, no qualification
ERLIN-D01N-SFW			
Iron	69.1%	75-125%	Qualify parent sample UJ MS-L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT060C

Sampling Event: March 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 05/07/03

Peer Reviewer: Alan Roberts

Date Completed: 05/13/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Metals	Inorganic	VOC	SVOC	BOD/COD
ONFH-T01N-SFW	SA	520163		W	X	X			X
ONFH-D01N-SFW	SA	520164		W	X				
RR-12-T01N-SFW	SA	520165		W	X	X			X
RR-12-D01N-SFW	SA	520167		W	X				
RR-11A1-T01N-SFW	SA	520168		W	X	X			X
RR-11A1-D01N-SFW	SA	520169		W	X				
ERLOUT-T01N-SFW	SA	520170		W	X	X			X
ERLOUT-D01N-SFW	SA	520171		W	X				
RR-5-T01N-SFW	SA	520172		W	X	X			X
RR-5-D01N-SFW	SA	520173		W	X				
RR-15-T01N-SFW	SA	520174		W	X	X			X
RR-15-D01N-SFW	SA	520175		W	X				
UNIQUE1-T01N-SFW	SA	520176		W	X	X			X
UNIQUE1-D01N-SFW	SA	520177		W	X				
RR-10A1-T01N-SFW	SA	520178		W	X	X			X
RR-10A1-D01N-SFW	SA	520179		W	X				
RR-20-T01N-SFW	SA	520180		W	X	X			X
RR-20-D01N-SFW	SA	520181		W	X				
RB04T-SFW	RB	520182		W	X	X			X
RB03T-SFW	RB	520183		W	X	X			X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

2 Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The ammonia analysis of the laboratory control sample yielded a percent recovery of 242%, which is double the expected value. The laboratory indicated that the high recovery is likely due to the blank inadvertently being spiked with twice the normal amount of spiking solution. The other blank spike analysis associated with this analytical sequence exhibited acceptable recoveries. The associated field samples were not considered to require qualification based on this probable spiking error.

The metals analyses in this SDG were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of samples, which were determined by the field pH determinations.

The laboratory incorrectly noted in the case narrative that the ICP/MS metals analyses of the Initial Calibration Verification samples associated with the analytical sequences from 4/16/03 to 4/22/03 yielded percent recoveries for selenium that marginally exceeded control criteria at 111%. However, the ICP/MS metals in the Continuing Calibration Verification (CCV2) from 4/22/03 for samples RR-11A1-D01N-SFW, RR-20-T01N-SFW, RR-20-D01N-SFW, RB04T-SFW, and RB03T-SFW did yield a percent recovery for selenium that slightly exceeded control criteria (90-110%) at 111%. Since the CCV recovery is greater than the limit and, the selenium results for RR-11A1-D01N-SFW, RR-20-T01N-SFW, RR-20-D01N-SFW, RB04T-SFW, and RB03T-SFW were all qualified non-detect based on blank contamination, no qualification was required based on the potentially high bias suggested by the CCV.

Selected surface water samples reported in this package were reanalyzed for dissolved aluminum, dissolved arsenic, and dissolved cadmium without dilution in order to achieve lower reporting limits to meet project objectives. The results for the re-analysis were reported in three data packages: WATRAS1, WATRAS2, and WATRAS3. Each package was reviewed in accordance with SOP 12.1. The results of the review are reported in separate data review narrative summaries. In all cases, the results for the re-analysis have been annotated to indicate which results were selected for reporting. The associated Data Validation Report for each sampling event affected contains further details.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, orthophosphate, and BOD. The analysis for pH and conductivity were exceeded by 1-2 and 15-16 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, arsenic, beryllium, and selenium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD/PDS RR-11A1-T01N-SFW RR-11A1-D01N-SFW RR-20-T01N-SFW RR-20-D01N-SFW • LD RR-11A1-T01N-SFW RR-11A1-D01N-SFW RR-20-T01N-SFW RR-20-D01N-SFW	No	The matrix spike (MS) percent recoveries for some analytes were out of limits in samples RR-11A1-T01N-SFW and RR-20-T01N-SFW. Table 1.3 summarizes these MS results. The MS results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent samples were qualified on the basis of MS results per SOP 12.1. The laboratory duplicate (LD) percent recovery for some analytes was out of limits in sample RR-11A1-T01N-SFW. Table 1.4 summarizes these LD results. The LD results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent samples were qualified on the basis of MS results per SOP 12.1.
Method QC • Surrogates • Serial Dilution RR-11A1-T01N-SFW RR-11A1-D01N-SFW RR-20-T01N-SFW RR-20-D01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analyses on samples RR-11A1-T01N-SFW, RR-11A1-D01N-SFW, RR-20-T01N-SFW, and RR-20-D01N-SFW, pH class C, were applicable for 0 out of 24 analytes. For samples RR-12-T01N-SFW, RR-11A1-T01N-SFW, ERLOUT-T01N-SFW, and UNIQUE1-T01N-SFW the partial analysis of orthophosphate exceeded that of the total analysis of phosphorus. Table 1.5 summarizes these results and the data qualifications. For samples ONFH-T01N/D01N-SFW, RR-11A1-T01N/D01N-SFW, and RR-12-T01N/D01N-SFW the dissolved analysis of lead and selenium exceeded that of the total analysis. Table 1.6 summarizes these results and the data qualification.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB03T-SFW RB04T-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were a few detections in the RB. These are summarized in Table 1.7. The RB results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the laboratory performance reviews, the following additional parameters were evaluated: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)	BOD (mg/L)	Conductivity (µmhos/cm)	pH
ONFH-T01N-SFW	0.51 J	0.0053 J	0.041 J	1.8 J	275 J	7.0 J
RR-12-T01N-SFW	0.65 J	0.36 J	0.0086 J	1.4 UJ	351 J	7.1 J
RR-11A1-T01N-SFW	0.62 J	---	---	---	266 J	7.2 J
ERLOUT-T01N-SFW	0.73 J	---	---	---	360 J	7.2 J
RR-5-T01N-SFW	0.92 J	---	---	---	263 J	7.6 J
RR-15-T01N-SFW	0.63 J	---	---	---	365 J	7.5 J
UNIQUE1-T01N-SFW	0.68 J	0.69 J	0.11 J	1.4 UJ	312 J	7.5 J
RR-10A1-T01N-SFW	0.82 J	0.025 J	0.017 J	1.4 UJ	285 J	7.4 J
RR-20-T01N-SFW	0.69 J	---	---	---	375 J	7.4 J
RB04T-SFW	0.40 UJ	---	---	---	---	7.5 J
RB03T-SFW	0.40 UJ	---	---	---	---	7.5 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=10	69.1	74.5 77.4	80.6 88.9				14.2	ERLOUT-T01N-SFW, RR-10A1-T01N-SFW, RR-10A1-D01N-SFW, RR-11A1-T01N-SFW, RR-12-T01N-SFW, RR-15-T01N-SFW, RR-20-T01N-SFW, RR-20-D01N-SFW, RR-5-T01N-SFW, UNIQUE1-T01N-SFW, UNIQUE1-D01N	U CCB-I
Antimony (MS) DF=2	0.5	0.5	0.4	0.5	0.5			ONFH-T01N-SFW, RR-20-D01N-SFW	U CCB-I
Arsenic (MS) DF=2	-0.3		-0.5	-0.3	-0.5	-1.084		All samples were qualified	UJ CCB, MB—SFWL J CCB, MB-L
Beryllium (P) DF=1	-0.4		-0.5					All samples were qualified	UJ CCB-L
Selenium (MS) DF=2	1.0 1.0	0.9	0.9	0.8		1.433		ERLOUT-D01N-SFW, ONFH-D01N-SFW, RB03T-SFW, RB04T-SFW, RR-10A1-D01N-SFW, RR-11A1-T01N-SFW, RR-11A1-D01N-SFW, RR-15-T01N-SFW, RR-20-T01N-SFW, RR-20-D01N-SFW, RR-5-D01N-SFW, UNIQUE1-D01N-SFW	U CCB, MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

[1] Compound is a tentatively identified compound (TIC). TICs in method blanks are not considered to be reportable as TICs for samples.

[2] Compound is a suspected aldol condensation product of acetone

Table 1.3
Matrix Spike Recoveries Not Meeting Criteria

Sample/Analytes	Matrix Spike Recovery	Acceptance Limits	Action
RR-11A1-T01N-SFW			
Bicarbonate Alkalinity	0.0%	75-125%	Qualify parent sample J MS-L
Orthophosphate	54.1%		Qualify parent sample J MS-L
RR-20-T01N-SFW			
Bicarbonate Alkalinity	0.0%	75-125%	Qualify parent sample J MS-H
Ammonia	70.6%		Qualify parent sample J MS-H

Table 1.4
Laboratory Duplicate Analyses Not Meeting Criteria

Sample/Analytes	Laboratory Duplicate RPD	Acceptance Limits	Action
RR-11A1-T01N-SFW			
Orthophosphate	46%	±20%	Qualify parent sample J D-H
Phosphorus	22%		Qualify parent sample J D-H

Table 1.5
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Absolute Difference	RL	Action
RR-12-T01N-SFW • Orthophosphate Vs. Phosphorus	0.328	0.010	Results for these analytes in the RR-12-T01N-SFW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
RR-11A1-T01N-SFW • Orthophosphate Vs. Phosphorus	0.098	0.010	Results for these analytes in the RR-11A1-T01N-SFW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
ERLOUT-T01N-SFW • Orthophosphate Vs. Phosphorus	0.052	0.010	Results for these analytes in the ERLOUT-T01N-SFW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
UNIQUE1-T01N-SFW • Orthophosphate Vs. Phosphorus	0.483	0.010	Results for these analytes in the UNIQUE1-T01N-SFW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.

Table 1.6
Total vs. Dissolved Qualifications for Metals

Sample/Analytes	Absolute Difference	RL	Action
ONFH-T01N/D01N-SFW • Lead	0.61	0.2	Results for these analytes in the ONFH-T01N/D01N-SFW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
RR-11A1-T01N/D01N-SFW • Selenium	2.4	1.0	Results for these analytes in the RR-11A1-T01N/D01N-SFW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.

Table 1.7
Positive Results for Rinsate Blanks

Analyte	RB03T-SFW (µg/l)	RB04T-SFW (µg/l)
TDS	32	24
TSS	---	1.6
Bicarbonate Alkalinity	2.6	2.8
Total Alkalinity	2.6	2.8
Ammonia	0.046	0.076
Selenium	2.4	2.2
Zinc	---	16.1

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT061C

Sampling Event: March 2003 SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 06/01/03

Peer Reviewer: Alan Roberts

Date Completed: 06/03/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses					
					Metals	Inorganics	BOD	COD	pH	Conductivity
RR-4-T01N-SFW	SA	520183	W	X	X	X	X	X	X	
RR-4-D01N-SFW	SA	520184	W	X						
RB01T-SFW	RB	520185	W	X	X	X	X			
SPRING17-T01N-GRW	SA	520186	W	X	X			X	X	
SPRING17-D01N-GRW	SA	520187	W	X						
SPRING18-T01N-GRW	SA	520188	W	X	X			X	X	
SPRING18-D01N-GRW	SA	520189	W	X						
ZWERGEL-T01N-SFW	SA	520341	W	X	X	X	X	X	X	
ZWERGEL-D01N-SFW	SA	520342	W	X						
CD-1-T01N-SFW	SA	520343	W	X	X	X	X	X	X	
CD-1-D01N-SFW	SA	520344	W	X						
RRS-18-T01N-SFW	SA	520345	W	X	X	X	X	X	X	
RRS-18-D01N-SFW	SA	520346	W	X						
RRS-9-T01N-SFW	SA	520347	W	X	X	X	X	X	X	
RRS-9-D01N-SFW	SA	520348	W	X						
RRS-23-T01N-SFW	SA	520349	W	X	X	X	X	X	X	
RRS-23-D01N-SFW	SA	520350	W	X						
RRS-23-T01D-SFW	FD	520351	W	X	X	X	X	X	X	
RRS-23-D01D-SFW	FD	520352	W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank

FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

A relative percent difference of 71% was calculated for the LCS/LCSD of the alkalinity analysis run on 04/02/03. The laboratory noted this difference was due to a difference in the known concentrations of the LCS and LCSD in the particular sequence. Both blank spike analyses exhibited acceptable percent recoveries and consequently qualification of data was not considered necessary.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Upon sample receipt and log-in, a discrepancy between the laboratory COC and sample labels was identified. The collection date for samples recorded on the laboratory field chain of custody form was 03/24/03. However, the sample labels indicated that the samples were collected on 03/23/03. After reviewing the date and time of relinquishment recorded on the laboratory COC, it was determined that the sample labels were correct. As such, the samples were logged in according to the sample collection date on the sample labels. No qualification of data was necessary on the basis of chain of custody or sample receipts.
Holding Times	No	The 48-hour holding times for nitrate, nitrite, orthophosphate, and BOD_5 were exceeded by several hours to one day (in the case of BOD_5) for many samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The TKN 28-day holding time for samples dated 03/23/03 was exceeded by nine days. Consequently, the TKN results for these samples were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken either 15 or 18 days after sampling and 13-16 days beyond log-in. The pH for all samples was measured between approximately eight hours to 11 days beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD ZWERGEL-T01N-SFWMS ZWERGEL-D01N-SFWMS • PDS • LD ZWERGEL-T01N-SFWREP ZWERGEL-D01N-SFWREP	No	Sample ZWERGEL-T01N-SFW recovered the matrix spike for nitrogen in the form of ammonia at 74.7%. This was slightly below the established control limit of 75-125%, thereby suggesting a potential low bias. As a result, the ammonia-nitrogen result of 0.090 mg/L was qualified as estimated with a low bias. The laboratory case narrative noted the replicate analyses associated with sample ZWERGEL-T01N-SFW exhibited RPDs above the control criteria for ammonia, total phosphorus, and TOC. The duplicate sample report summary verified the relative percent differences for these three analytes: ammonia-nitrogen (26%), total phosphorus (27%), and total organic carbon (200%). For all three analytes, the sample concentrations and the associated duplicate results were less than 5x the RL. Therefore the absolute differences between the two results were compared to an evaluation criterion of $\leq$ 1x the greater RL. As a result, only TOC required qualification. The sample result reported TOC as nondetect at 1.0 mg/L and the duplicate sample reported 2.1 mg/L, a difference of 1.1 mg/L (> than 1x 1.0 mg/L). This resulted in the qualification of TOC in the parent sample as estimated (J/UJ) with an indeterminate direction of bias. The matrix quality control results for the March 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) ZWERGEL-T01N-SFW ZWERGEL-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample ZWERGEL-T01N-SFW was not applicable for all 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL, (adjusted for dilution). It was therefore not necessary to qualify any results on the basis of serial dilutions. The orthophosphate concentration in three samples was greater than its corresponding phosphorus concentration. In all cases, the absolute difference between the two results was compared to an evaluation criterion of ±2x RL (using the higher RL). Accordingly, the orthophosphate and phosphorus results for all samples were qualified as estimated (J/UJ) with an indeterminate direction of bias. Table 1.3 summarizes the samples with their partial and total concentrations for phosphorus and their suggested data qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5, with the exception of samples ZWERGEL-T/D01N-SFW, which reported ratios of 1.58. Due to the fact the TDS calculated was greater than the TDS measured, the TDS result for ZWERGEL-T01N-SFW was qualified as estimated (J) with a low bias direction and a qualifier code of " TvP".
Field QC • Field Duplicate RRS-23-T01D-SFW RRS-23-D01D-SFW • Rinsate Blank RB01T-SFW • Field Blank • Trip Blank	Yes	Field duplicates were assessed for overall precision of the analysis and representativeness to the medium. All results for the field duplicate pair satisfied the evaluation criteria in the QAPP. Several analytes were detected in the rinsate blank analyzed with this data set. Table 1.4 summarizes the analytes detected and their reported concentrations. The Field QC results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	TKN	Ortho-P	BOD_5	Cond.	pH
RR-4-T01N-SFW	0.40 UJ	---	---	---	---	249 J	7.2 J
RB01T-SOL	0.40 UJ	---	---	---	---	---	---
SPRING17-T01N-GRW	0.55 J	0.0050 UJ	---	0.37 J	---	444 J	7.4 J
SPRING18-T01N-GRW	0.52 J	0.0050 UJ	---	0.097 J	---	314 J	7.9 J
ZWERGEL-T01N-SFW	0.40 UJ	0.0050 UJ	0.24 UJ	0.073 J	1.5 UJ	181 J	7.7 J
CD-1-T01N-SFW	0.62 J	0.0050 UJ	0.24 UJ	0.77 J	1.5 UJ	350 J	7.6 J
RRS-18-T01N-SFW	0.40 UJ	0.0050 UJ	0.24 UJ	0.010 UJ	1.5 UJ	160 J	7.6 J
RRS-9-T01N-SFW	0.40 UJ	0.0050 UJ	0.24 UJ	0.010 UJ	1.5 UJ	134 J	7.6 J
RRS-23-T01N-SFW	0.40 UJ	0.0050 UJ	0.24 UJ	0.010 UJ	1.5 UJ	169 J	7.6 J
RRS-23-T01D-SFW	0.40 UJ	0.0050 UJ	0.24 UJ	0.010 UJ	1.5 UJ	165 J	7.5 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Arsenic (MS)	0.5	---	0.3	0.4	---	---	0.2	All samples with the **exception** of: SPRING17-D01N-GRW SPRING17-T01N-GRW SPRING18-D01N-GRW SPRING18-T01N-GRW	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Beryllium (P)	---	---	---	0.5	-0.8	---	0.5	None of the samples were qualified, as the Be results were all nondetect for the samples associated with CCB4. (No samples associated w/CCB5).	---
Cadmium (P)	---	0.5	0.6	0.5	0.7	---	0.5	CD-1-D01N-SFW CD-1-T01N-SFW RR-4-D01N-SFW ZWERGEL-D01N-SFW	U CCB-I
Copper (P)	2.0	3.0	3.7	4.0	4.3	1.654	1.5	All samples with the **exception** of: CD-1-T01N-SFW RR-4-T01N-SFW	U CCB-I or U MB,CCB-I
Iron (P)	62.8	42.2	48.3	---	56.2	---	42.2	CD-1-T01N-SFW RR-4-T01N-SFW	U CCB-I
Molybdenum (P)	---	-2.9	---	---	---	---	2.2	CD-1-T01N-SFW RB01T-SFW RR-4-T01N-SFW RR-4-D01N-SFW SPRING17-D01N-GRW SPRING17-T01N-GRW ZWERGEL-D01N-SFW ZWERGEL-T01N-SFW	J CCB-L or UJ CCB-L
Selenium (MS)	---	0.6	---	---	---	---	0.5	CD-1-T01N-SFW RB01T-SFW RR-4-D01N-SFW RR-4-T01N-SFW RRS-18-T01N-SFW RRS-23-T01D-SFW SPRING17-D01N-GRW SPRING17-T01N-GRW SPRING18-D01N-GRW ZWERGEL-D01N-SFW ZWERGEL-T01N-SFW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total Phosphorus vs. Orthophosphate Data Qualification

Sample	Orthophosphate (mg/L)	Total Phosphorus (mg/L)	Qualification and Qualification Codes
ZWERGEL-T01N-SFW	0.073	0.025	J TvP-I or UJ TvP-I
SPRING17-T01N-GRW	0.37	0.010	
SPRING18-T01N-GRW	0.097	0.017	
CD-1-T01N-SFW	0.77	0.059	

Table 1.4
Field Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB01T-SFW	03/21/03	Bicarbonate Alkalinity	2.8	1.0
		Total Alkalinity	2.8	1.0
		Ammonia-Nitrogen	0.099	0.040
		Total phosphorus	0.016	0.010

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT062C

Sampling Event: March 2003 SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 05/14/03

Peer Reviewer: Alan Roberts

Date Completed: 05/15/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses					
					Metals	Inorganics	BOD	COD	pH	Conductivity
RRS-15-T01N-SFW	SA	520417	W	X	X	X	X	X	X	
RRS-15-D01N-SFW	SA	520418	W	X						
UNIQUE3-T01N-SFW	SA	520419	W	X	X	X	X	X	X	
UNIQUE3-D01N-SFW	SA	520420	W	X						
LR-8A-T01N-SFW	SA	520421	W	X	X	X	X	X	X	
LR-8A-D01N-SFW	SA	520422	W	X						
LR-8A-T01D-SFW	FD	520423	W	X	X	X	X	X	X	
LR-8A-D01D-SFW	FD	520424	W	X						
LR-4-T01N-SFW	SA	520425	W	X	X	X	X	X	X	
LR-4-D01N-SFW	SA	520426	W	X						
UNIQUE2-T01N-SFW	SA	520427	W	X	X	X	X	X	X	
UNIQUE2-D01N-SFW	SA	520428	W	X						
RRS-12-T01N-SFW	SA	520429	W	X	X	X	X	X	X	
RRS-12-D01N-SFW	SA	520430	W	X						
RRS-13-T01N-SFW	SA	520431	W	X	X	X	X	X	X	
RRS-13-D01N-SFW	SA	520432	W	X						
RRS-20-T01N-SFW	SA	520433	W	X	X	X	X	X	X	
RRS-20-D01N-SFW	SA	520434	W	X						
RRS-27-T01N-SFW	SA	520435	W	X	X	X	X	X	X	
RRS-27-D01N-SFW	SA	520436	W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted the TOC analyses of the initial calibration verification standard and the closing check standard associated with the analytical sequence of 04/05/03 yielded percent recoveries that exceeded control criteria. The associated field samples exhibited concentrations below the RL as specified by the QAPP, and consequently did not require qualification of data; as this potential high bias did not affect the usability of the data.

The laboratory case narrative noted the ICP/MS metals analyses of the continuing calibration check standards and blanks from the analytical sequence 050703-02 yielded percent recoveries of the internal standard Indium that marginally exceeded control criteria. Upon review of the ICP-MS metals raw data sheets (Internal Standards Review Report), it was determined that this data package was associated with analytical sequence 040703-02 instead and that all internal standard recoveries, including Indium, for all QC and field samples were within the acceptance range. There was no effect on the usability or quality of data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Upon sample receipt and log-in, a discrepancy between the laboratory COC and sample labels was identified. The collection date for all samples recorded on the laboratory field chain of custody form was 03/24/03. However, the sample labels indicated that the samples were collected on 03/23/03. After reviewing the date and time of relinquishment recorded on the laboratory COC, it was determined that the sample labels were correct. As such, the samples were logged in according to the sample collection date on the sample labels. No qualification of data was necessary on the basis of chain of custody or sample receipts.
Holding Times	No	The 48-hour holding times for nitrate, nitrite, orthophosphate, and BOD_5 were exceeded by several hours to one day (in the case of BOD_5) for many samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductivity and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 18 days after sampling and 16 days beyond log-in. The pH for all samples was measured approximately 1.5 days after log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.
Matrix QC • MS/MSD • PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the March 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (C) RRS-15-T01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample RRS-15-T01N-SFW was not applicable for all 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL, (adjusted for dilution). It was therefore not necessary to qualify any results on the basis of serial dilutions. The orthophosphate concentration in three samples was greater than its corresponding phosphorus concentration. In all cases, the absolute difference between the two results was compared to an evaluation criterion of ±2x RL (using the higher RL). Accordingly, the orthophosphate and phosphorus results for all samples were qualified as estimated (J/UJ) with an indeterminate direction of bias. Table 1.3 summarizes the samples with their partial and total concentrations for phosphorus and their suggested data qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
• Field QC • Field Duplicate LR-8A-T01D-SFW LR-8A-D01D-SFW • Rinsate Blank • Field Blank • Trip Blank	No	All results for these field duplicate pairs satisfied the evaluation criteria in the QAPP except for orthophosphate. Accordingly, the orthophosphate results were qualified as estimated (J/UJ) with an indeterminate direction of bias. The Field QC results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	BOD_5	Cond.	pH
RR-15-T01N-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	1.5 UJ	146 J	7.6 J
UNIQUE3-T01N-SFW	0.66 J	0.0050 UJ	0.010 UJ	1.5 UJ	375 J	7.5 J
LR-8A-T01N-SFW	0.58 J	0.0050 UJ	0.010 UJ	1.5 UJ	472 J	7.4 J
LR-8A-T01D-SFW	0.61 J	0.0050 UJ	2.2 J	1.5 UJ	483 J	7.4 J
LR-4-T01N-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	1.5 UJ	695 J	7.6 J
UNIQUE2-T01N-SFW	0.89 J	0.0050 UJ	0.41 J	1.5 UJ	376 J	7.4 J
RRS-12-T01N-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	1.5 UJ	183 J	7.5 J
RRS-13-T01N-SFW	0.40 UJ	0.0050 UJ	0.082 J	1.5 UJ	148 J	7.6 J
RRS-20-T01N-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	1.5 UJ	170 J	7.5 J
RRS-27-T01N-SFW	0.44 J	0.0050 UJ	0.010 UJ	1.5 UJ	201 J	7.5 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P)	66.3	88.6	102.3	122.4	---	---	50.3	LR-4-T01N-SFW LR-8A-D01D-SFW LR-8A-D01N-SFW RRS-12-D01N-SFW RRS-12-T01N-SFW RRS-13-T01N-SFW RRS-15-T01N-SFW UNIQUE2-D01N-SFW UNIQUE3-D01N-SFW	U CCB-I
Antimony (MS)	0.9	0.6	0.6	0.6	---	---	0.60	RRS-15-T01N-SFW	U CCB-I
Arsenic (MS)	0.5	---	0.3	0.4	0.4	0.512	0.2	All samples	U MB,CCB-I
Beryllium (P)	0.3	0.6	0.8	1.1	---	0.511	0.3	All samples with the **exception** of: RRS-15-D01N-SFW UNIQUE2-T01N-SFW	U MB,CCB-I
Copper (P)	---	---	---	-2.1	---	---	1.5	RRS-20-D01N-SFW RRS-20-T01N-SFW RRS-27-D01N-SFW RRS-27-T01N-SFW	UJ CCB-L
Iron (P)	44.6	---	---	62.9	---	---	42.2	LR-8A-T01N-SFW UNIQUE3-T01N-SFW	U CCB-I
Selenium (MS)	0.9/1.2	1.8/0.7	---	---	---	1.438	0.5	LR-4-T01N-SFW LR-8A-D01N-SFW LR-8A-T01D-SFW LR-8A-T01N-SFW RRS-12-D01N-SFW RRS-13-D01N-SFW RRS-13-T01N-SFW RRS-15-D01N-SFW RRS-15-T01N-SFW RRS-20-D01N-SFW RRS-20-T01N-SFW UNIQUE2-T01N-SFW UNIQUE3-D01N-SFW UNIQUE3-T01N-SFW	U MB,CCB-I or U MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Sodium (P)	998.0	---	---	---	---	1173.0	916.3	All samples with the **exception** of: RRS-15-T01N-SFW RRS-20-D01N-SFW	U MB-I or U MB,CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Analysis Data Qualification

Sample	Orthophosphate (mg/L)	Total Phosphorus (mg/L)	Qualification and Qualification Codes
LR-8A-T01N-SFW	2.2	0.045	J TvP-I or UJ TvP-I
UNIQUE2-T01N-SFW	0.41	0.014	
RRS-13-T01N-SFW	0.082	0.010	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT063C

Sampling Event: March 2003 SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

LP Reviewer: Brian Olmsted

Date Completed: 01/30/04

Data Reviewer: Karen Kronoveter

Date Completed: 06/03/03

Peer Reviewer: Alan Roberts

Date Completed: 06/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses					
					Metals	Inorganics	BOD	COD	pH	Conductivity
UCC-T01N-SFW	SA	520499	W	X	X	X	X	X	X	
UCC-D01N-SFW	SA	520500	W	X						
RB02T-SFW	RB	520501	W	X	X	X	X	X	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted the original anion/cation balance for location UCC calculated a percentage in excess of 13%. The sulfate analysis for sample UCC-T01N-SFW was consequently repeated outside of the prescribed holding time, resulting in an acceptable anion/cation balance calculation. Accordingly, the sulfate result was qualified as estimated on the basis of holding time.

It was noted by the laboratory that the original conductivity analysis of sample RB02T-SFW resulted in unusable results due to an instrument error. The conductivity analysis of this sample was repeated four days later and results in acceptable results. Qualification of specific conductance data on the basis of holding time is summarized in Table 1-1.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Upon sample receipt and log-in, a discrepancy between the laboratory COC and sample labels was identified. The collection date for all samples recorded on the laboratory field chain of custody form was 03/24/03. However, the sample labels indicated that the samples were collected on 03/23/03. After reviewing the date and time of relinquishment recorded on the laboratory COC, it was determined that the sample labels were correct. As such, the samples were logged in according to the sample collection date on the sample labels. No qualification of data was necessary on the basis of chain of custody or sample receipts.
Holding Times	No	The 48-hour holding times for nitrate, nitrite, orthophosphate, and BOD_5 were exceeded by several hours to one day (in the case of BOD_5) for the samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The prescribed analytical holding time of 28 days for the sulfate analyses was exceeded by ten days for sample UCC-T01N-SFW. Sulfate results for this sample was qualified as estimated (J). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for samples UCC-T01N-SFW and RB02T-SFW were taken 12 and 32 days after sampling, respectively. The pH for all samples was measured approximately 1.5 days after log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value.
Matrix QC • MS/MSD • PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the March 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) UCC-T01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample UCC-T01N-SFW was not applicable for all 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL, (adjusted for dilution). It was therefore not necessary to qualify any results on the basis of serial dilutions. The orthophosphate concentration of 1.7 mg/L in sample UCC-T01N-SFW was greater than its corresponding phosphorus concentration of 0.010 mg/L. Due to the fact that both concentrations were not greater than five times the RL (0.050 mg/L), the absolute difference between the two results was compared to an evaluation criterion of ±2x RL (using the higher RL). Accordingly, the orthophosphate and phosphorus results for sample UCC-T01N-SFW was qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. The reported cation/anion balance for sample UCC-T/D01N-SFW met this criterion and consequently did not require data qualification. The laboratory did not provide the cation/anion balance for RB02T-SFW. The calculated %deviation for the balance was –88.61%. The sulfate result was approximately 20 times greater than the maximum amount predicted by the cation summation. Sample UCC-T-SFW (run at the same time) was

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		25 times too high relative to the reanalysis result. The UCC sample was reanalyzed, while the rinsate blank was not. It is likely that the dilution factor (DF) of 50 was the result of a transcription error for both samples analyzed on 03/20/03. Therefore, based on the anion/cation balance and the suggestive evidence of the incorrect DF for UCC, the sulfate result for the rinsate blank was rejected as not being of known quality. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank RB02T-SFW • Field Blank • Trip Blank	N/A	Several analytes were detected in the rinsate blank associated with this data set. Table 1.3 summarizes the analytes detected and their reported concentrations. The Field QC results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	N/A	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	BOD_5	Cond.	pH	Sulfate
UCC-T01N-SFW	0.40 UJ	0.0050 UJ	1.7 J	1.5 UJ	163 J	7.6 J	36.5 J
RB02T-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	1.5 UJ	0.71 J	7.7 J	J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (MS)	1.4	1.5	---	---	---	1.199	0.3	UCC-T01N-SFW	U MB,CCB-I
Arsenic (MS)	0.5	---	0.3	0.4	---	0.315	0.2	RB02T-SFW UCC-D01N-SFW	U MB,CCB-I
Beryllium (P)	---	---	0.4	---	---	---	0.3	None of the samples were associated with CCB3	---

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Rinsate Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB02T-SFW	03/23/03	Total Dissolved Solids	40.0	10.0
		Bicarbonate Alkalinity	2.9	1.0
		Total Alkalinity	2.9	1.0
		Ammonia-Nitrogen	0.10	0.04
		Sulfate	R	R
		Chromium	0.001	0.001
		Selenium	0.0039	0.001

R = Rejected

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT087C

Sampling Event: Spring 2003 Surface and April Groundwater

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 07/07/03

Peer Reviewer: Stacey Coker

Date Completed: 07/17/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses								
				Metals	Inorganics	VOCs	SVOCs	Explosives	BOD	COD	pH	Conductivity
RB01T-GRW	RB	522878	W	X	X	X	X	X			X	X
RB03T-GRW	RB	522879	W	X	X			X			X	X
RB03D-GRW	RB	522880	W	X								
RB02T-GRW	RB	522881	W	X	X	X	X	X			X	X
TB203-GRW	TB	522882	W			X						
UFLIN-T01N-SFW	SA	522883	W	X	X				X	X	X	X
UFLIN-D01N-SFW	SA	522884	W	X								
UFLMID-T01N-SFW	SA	522885	W	X	X				X	X	X	X
UFLMID-D01N-SFW	SA	522886	W	X								
UFLOUT-T01N-SFW	SA	522887	W	X	X				X	X	X	X
UFLOUT-D01N-SFW	SA	522888	W	X								
FB03T-GRW	FB	522889	W					X				
TB165-GRW	TB	522890	W			X						

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory noted that sample identifiers were abbreviated, in certain instances, to accommodate field length limitations in the data processing. Upon review of the sample IDs, it was verified that all were complete and the comment by the laboratory was not relevant to this package.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions were based on the pH categories of the samples, which were determined by the field pH determinations, with the exception of arsenic for this delivery group. Arsenic for the surface water samples was reported from the full straight analysis as opposed to the two-fold dilution in order to obtain a reporting limit sufficient for comparing results to New Mexico Water Quality Criteria.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW087C, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified on the quantitation reports. Included in the data package were the extracted ion current profiles.

The laboratory case narrative noted the semivolatile organics analyses of the blank spike samples associated with this delivery group yielded generally acceptable recoveries, with the exception of 4-Nitrophenol and Pentachlorophenol. 4-Nitrophenol was recovered in H1LCS at 77% (with a QC range of 10-80%) as was Pentachlorophenol at 95% (with a QC range of 9-103%). Due to the fact that both LCSD recoveries were just above 100%, they were not considered indicative of unacceptable accuracy. It was therefore unnecessary to qualify data on the basis of laboratory control standard recoveries for semivolatile organic data.

As noted in the laboratory narrative, the nitroaromatics analysis of the blank spike duplicate sample O3LCSD yielded a percent recovery of PYX (62%) that was below the lower limit of the control range of 70-130%. The laboratory control sample (O3LCS) was recovered at 72%, marginally within acceptance limits. Due to the fact that PYX was recovered outside the acceptance range but greater than 10%, all PYX results were qualified as estimated (UJ) with a low bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for all samples were accomplished five days beyond the prescribed analytical holding time of 48 hours due to a malfunction of the IC instrument autosampler device. Accordingly, all nitrate results for all samples were qualified as estimated (J/UJ). The laboratory case narrative noted the TKN analyses of the samples in this data package were analyzed one day beyond the prescribed analytical holding time of 28 days. Upon review of the collection dates/times along with the analytical run dates on the sample report summaries, it was determined that the TKN analyses run on 05/05/03 met the holding time criterion. However, several samples were analyzed for TKN on 05/08/03 and consequently were run 1 day beyond the holding time. The laboratory noted, and as verified in the raw data sheets, the samples were digested within the holding time. The TKN results for samples run on 05/08/03 were qualified as estimated (J/UJ). In addition, all nitrite, orthophosphate, and BOD_5 analyses for all applicable samples were run several hours beyond the prescribed holding

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		time of 48 hours and were consequently qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken seven days after sampling and five days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. 1,2,4-Trichlorobenzene was detected in the volatile blank VBLKQ4 analyzed on 04/14/03. 1,2,4-Trichlorobenzene was reported as nondetect for all volatile samples analyzed in this data package, and consequently no volatile data was qualified on the basis of method blanks. Bis (2-Ethylhexyl)phthalate was detected in the semivolatile blank SBLKH1 analyzed on 04/17/03 at a concentration of 2 µg/L. The two semivolatile samples in this package (RB01T-GRW and RB02T-GRW) reported bis (2-Ethylhexyl)phthalate concentrations less than 5x that detected in the blank and these results were therefore qualified as nondetect with an indeterminate direction of bias. An unknown trichloropropene was reported as a tentatively identified compound present in the semivolatile blank SBLKH1. TICs in method blanks are not considered to be reportable as TICs for samples. No qualification was necessary, as this TIC was not present in either semivolatile sample. 2-pentanone, 4-hydroxy-4-methyl detected in RB02T-GRW, but not in the method blank, was qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) RB01T-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on rinsate blank sample RB01T-GRW was not applicable for all 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL, (adjusted for dilution). All of the initial sample results were nondetect with the exception of beryllium and potassium. The serial dilution analysis could not be used to evaluate whether or not significant physical or chemical interferences existed as a result of the sample matrix. It was therefore not necessary to qualify any results on the basis of serial dilutions. The surrogate recovery for the explosive analysis was low in rinsate blank samples RB01T-GRW and RB03T-GRW. The recoveries of 1,2-dinitrobenzene were 81% and 80%, respectively. These recoveries were outside the acceptance range of 85-116%, suggesting a potential low bias in the associated sample results. All results for both samples were qualified as estimated (UJ), no qualification was necessary for the blank sample.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The orthophosphate concentration of 0.046 mg/L in sample RB01T-GRW was greater than its corresponding phosphorus concentration of 0.010 mg/L. Due to the fact that both concentrations were not greater than five times the RL (0.01 mg/L), the absolute difference between the two results was compared to an evaluation criterion of ±2x RL (using the higher RL). Accordingly, the orthophosphate and phosphorus results for sample RB01T-GRW were qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. The laboratory case narrative noted all samples in this delivery group exhibited ion balance percent differences within the acceptance range. However, upon review of the summary sheet, it was noted that rinsate blank sample RB03*-GRW reported a 61.42% difference between the sum of anions and cations. The cation/anion balances for this sample was verified independently. The concentrations in the sample was low enough that the reporting limits controlled the calculations. The balance was therefore not an appropriate measure of accuracy. No qualification of data in this delivery group was considered necessary on the basis of cation/anion imbalances. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5, with the exception of RB03*-GRW; which reported a TDS ratio of 3.21. This TDS calculated result was artificially high due to elevated RLs associated with nondetect analytes. No qualification was considered necessary.
Field QC • Field Duplicate • Rinsate Blank RB01T-GRW RB03T-GRW RB03D-GRW RB02T-GRW • Field Blank FB03T-GRW • Trip Blank TB203-GRW TB165-GRW	N/A	Multiple analytes were detected in the rinsate blanks analyzed with this data set. Table 1.3 summarizes the analytes detected and their reported concentrations. The field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	Rinsate blank sample RB02T-GRW was marked on the COC for volatile analysis. However, upon review of the raw data sheets, it was verified that this sample was not analyzed for volatiles. The laboratory was contacted about this discrepancy on 07/23/03. We are currently waiting for a response from the laboratory to determine the final word on this sample and how this might affect QC.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial Calibration • VOCs/SVOCs: Continuing Calibration • SVOCs: Initial Calibration Verification Tables 1.4a and 1.4b summarized the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. Table 1.5 summarizes qualifications on the basis of initial calibration verification for semivolatile analytes in all SVOC samples.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho P	TKN	BOD_5	Conductivity	pH
RB01T-GRW	0.40 UJ	0.0050 UJ	0.046 J	---	---	3.1 J	4.6 J
RB03T-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	---	---	0.10 J	4.6 J
RB02T-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	0.24 UJ	---	0.12 J	5.6 J
UFLIN-T01N-SFW	0.49 J	0.0050 UJ	0.010 UJ	0.24 UJ	1.5 UJ	267 J	5.9 J
UFLMID-T01N-SFW	0.52 J	0.0050 UJ	0.013 J	0.24 UJ	1.5 UJ	264 J	6.9 J
UFLOUT-T01N-SFW	0.45 J	0.0050 UJ	0.010 UJ	0.24 UJ	1.5 UJ	264 J	7.4 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P)	---	-92.8	-56.6	-37.2	-86.840	27.7	All samples were qualified	UJ MB,CCB-L or J MB,CCB-L or J MB-L
Beryllium (P)	---	0.7	0.4	---	0.60	0.3	All samples were qualified	U MB,CCB-I
Copper (P)	---	-2.5	---	---	---	2.4	All samples were qualified with the **exception** of: UFLIN-T01N-SFW UFLMID-D01N-SFW UFLOUT-D01N-SFW UFLOUT-T01N-SFW	UJ CCB-L or J CCB-L
Iron (P)	---	---	43.2	---	67.790	42.2	UFLMID-T01N-SFW UFLOUT-T01N-SFW	U CCB-I
Lead (MS)	---	---	---	---	-1.144	0.10	All samples were qualified	UJ MB-L
Potassium (P)	341.0	2089.0	1999.0	1872.0	1866.0	327.4	All samples were qualified	U MC,CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Field Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB01T-GRW	04/09/03	Total Dissolved Solids	164	10.0
		Chloride	0.96	0.40
		Bicarbonate Alkalinity	2.2	1.0
		Total Alkalinity	2.2	1.0
		Ammonia-Nitrogen	0.11	0.040
		Orthophosphate-P	0.046 J	0.010
		Chloroform	0.002 J	0.01
RB02T-GRW	04/09/03	Total Dissolved Solids	102	10.0
		Bicarbonate Alkalinity	2.5	1.0
		Total Alkalinity	2.5	1.0
		Ammonia-Nitrogen	0.11	0.040
RB03T-GRW	04/09/03	Total Dissolved Solids	10.0	10.0
		Total Suspended Solids	0.50	0.50
		Bicarbonate Alkalinity	2.5	1.0
		Total Alkalinity	2.5	1.0
		Ammonia-Nitrogen	0.14	0.040
		Total Organic Carbon	1.7	1.0

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.4a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% RSD >30%	Action	Qualification and Qualification Codes
VOC	04/07/03 (1234)	2-Hexanone	50.0	Results for this analyte in all samples were qualified as estimated.	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.4b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
SVOC	04/17/03 (0942)	2,4-Dinitrophenol	55.4	All sample results were qualified as estimated	UJ CCAL-I
		4-Nitrophenol	46.3		
		4-Nitroaniline	28.4		
		4,6-Dinitro-2-methylphenol	36.9		
		Pentachlorophenol	37.8		
		3,3'-Dichlorobenzidine	46.3		
		Di-n-octylphthalate	43.8		
		Indeno(1,2,3-cd)pyrene	29.6		
		Dibenz(a,h)anthracene	33.2		
VOC	04/14/03 (0946)	2-Hexanone	52.2	All sample results were qualified as estimated	UJ CCAL-I

CCAL = Continuing Calibration %D = Percent Difference

Table 1.5
Initial Calibration Verification Results For Method Spike
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	Analyte	% Recovery	QC Limits	Qualification Codes
SVOC	2,4-Dimethylphenol	64.42	75-125	UJ ICV-L
	3-Nitroaniline	66.06		
	2,4-Dinitrophenol	66.72		
	4-Nitrophenol	71.38		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WATRAS1 Sampling Event: SFW Re-analyses

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 09/10/03

Peer Reviewer: Stacey Coker Date Completed: 09/12/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[(2)]	Matrix	Analysis
					Metals
RR-14-D01N-SFW	SA	537486		W	X
RR-12-D01N-SFW	SA	537487		W	X
RR-13-D01N-SFW	SA	537488		W	X
RR-13-D01D-SFW	FD	537489		W	X
RR-16-D01N-SFW	SA	537490		W	X
RR-11C-D01N-SFW	SA	537491		W	X
RR-10A1-D01N-SFW	SA	537492		W	X
RR-11A1-D01N-SFW	SA	537493		W	X
RR-7-D01N-SFW	SA	537494		W	X
RR-10-D01N-SFW	SA	537495		W	X
RR-DS-SPRING13-D01N-SFW	SA	537496	RR-DSSPRG13-D01N-SFW-020203	W	X
RR-DS-SPRING13-D01D-SFW	FD	537497	RR-DSSPRG13-D01D-SFW	W	X
RR-DS-SPRING39-D01N-SFW	SA	537498	RR-DSSPRG39-D01N-SFW	W	X
RR-US-SPRING13-D01N-SFW	SA	537499	RR-USSPRG13-D01N-SFW	W	X
RR-US-SPRING39A-D01N-SFW	SA	537500	RR-USSPRG39A-D01N-SFW	W	X
RR-US-SPRING39-D01N-SFW	SA	537501	RR-USSPRG39-D01N-SFW	W	X
RR-DS-SPRING13-D01N-SFW	SA	537502	RR-DSSPRG13-D01N-SFW-020903	W	X
RR-DS-SPRING13-D01N-SFW	SA	537503	RRDSSPG13-D01N-SFW	W	X
RR-US-SPRING13-D01N-SFW	SA	537504	RRUSSPRING13-D01N-SFW	W	X
RR-DS-SPRING39-D01D-SFW	FD	537505	RRDSSPRING-D01D-SFW	W	X

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The analytical results presented in the enclosed submittal represent re-analyses performed for surface water samples collected in January, February and March. These samples were re-analyzed for dissolved Aluminum, dissolved Arsenic and dissolved Cadmium with no dilutions to achieve the lowest possible reporting limit.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	N/A	
Holding Times	No	The 180-day holding time for metals was exceeded by numerous days for the majority of samples. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blank Results	No	Aluminum was detected in the initial calibration and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any matrix spike, post-digestion spike or laboratory duplicates. The matrix QC analyses for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Method QC • Surrogates • Serial Dilution RR-14-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	None of the three metals for the serial dilution analysis on sample RR-14-D01N-GRW were applicable, as all initial sample results were not sufficiently larger (x50) than the IDL (adjusted for dilution).
Field QC • Field Duplicates RR-13-D01D-SFW RR-DS-SPRING13-D01D-SFW RR-DS-SPRING39-D01D-SFW • Rinsate Blank • Field Blank • Trip Blank	Yes	The results for all field duplicate pairs satisfied the concentration-dependent evaluation criteria outlined in SOP 12.1. The parent sample for RR-DS-SPRING39-D01D-SFW was not included in the data package, however, it is included in the WATRAS2 package. The field duplicate pairs between the two data packages satisfy the concentration-dependent evaluation criteria outlined in SOP 12.1. This package did not include any rinsate, field or trip blanks. The field duplicate results for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Nondetect Results w/ Elevated RLs?	N/A	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Results Outside Evaluation Criteria and Resultant Data Qualification

Sample	# of Days in Excess of Holding Time	Metals			Qualification
		Aluminum	Arsenic	Cadmium	
RR-14-D01N-SFW	207	73.6 J	0.20 U	0.84 J	UJ HT-I Or J HT-I
RR-12-D01N-SFW	208	112 J	0.20 U	0.59 J	
RR-13-D01N-SFW	208	126 J	0.20 U	0.56 J	
RR-13-D01D-SFW	208	134 J	0.20 U	0.52 J	
RR-16-D01N-SFW	207	73.2 J	0.20 U	0.77 J	
RR-11C-D01N-SFW	208	158 J	0.20 U	0.62 J	
RR-10A1-D01N-SFW	208	83.2 J	0.20 U	0.33 J	
RR-11A1-D01N-SFW	208	68.5 J	0.20 U	0.25 J	
RR-7-D01N-SFW	209	116 J	0.20 U	0.42 J	
RR-10-D01N-SFW	209	110 J	0.20 U	0.34 J	
RR-DS-SPRING13-D01N-SFW	193	279 J	0.20 U	0.84 J	
RR-DS-SPRING13-D01D-SFW	193	232 J	0.20 U	0.91 J	
RR-DS-SPRING39-D01N-SFW	193	110 J	0.20 U	0.60 J	
RR-US-SPRING13-D01N-SFW	193	128 J	0.20 U	0.66 J	
RR-US-SPRING39A-D01N-SFW	193	90.9 J	0.20 U	0.46 J	
RR-US-SPRING39-D01N-SFW	193	78.4 J	0.20 U	0.53 J	
RR-DS-SPRING13-D01N-SFW	186	119 J	0.20 U	0.75 J	

Table 1.2
Blank Detection Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	ICB (µg/l)	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	21.7	23.9	32.4	34.8	37.5	18.3	RR-14-D01N-SFW RR-12-D01N-SFW RR-13-D01N-SFW RR-13-D01D-SFW RR-16-D01N-SFW RR-11C-D01N-SFW RR-10A1-D01N-SFW RR-11A1-D01N-SFW RR-7-D01N-SFW RR-10-D01N-SFW RR-DS-SPRING39-D01N-SFW RR-US-SPRING13-D01N-SFW RR-US-SPRING39A-D01N-SFW RR-US-SPRING39-D01N-SFW RR-DS-SPRING13-D01N-SFW RR-DS-SPRING13-D01N-SFW RR-US-SPRING13-D01N-SFW RR-DS-SPRING39-D01D-SFW	U CCB-I

MB=Method Blank P=ICP ICB – Initial Calibration Blank CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table is limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WATRAS2 Sampling Event: SFW Re-analyses

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 09/11/03

Peer Reviewer: Stacey Coker Date Completed: 09/12/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[(2)]	Matrix	Analysis
					Metals
RR-US-SPRING39-D01N-SFW	SA	537506	RR-US-SPRG39-D01N-SFW	W	X
RR-DS-SPRING39-D01N-SFW	SA	537507	RR-DS-SPRG39-D01N-SFW	W	X
RR-18A-D01N-SFW	SA	537508		W	X
RR-17-D01N-SFW	SA	537509		W	X
RR-18B-D01N-SFW	SA	537510		W	X
RR-16-D01N-SFW	SA	537511		W	X
LR-5-D01N-SFW	SA	537512		W	X
RR-6-D01N-SFW	SA	537513		W	X
RR-6A-D01N-SFW	SA	537514		W	X
RR-7-D01N-SFW	SA	537515		W	X
RR-1-T01N-SFW	SA	537516		W	
RR-1-D01N-SFW	SA	537517		W	X
RR-3-D01N-SFW	SA	537518		W	X
LR-13-D01N-SFW	SA	537519		W	X
LR-16-D01N-SFW	SA	537520		W	X
RR-14-D01N-SFW	SA	537521		W	X
RR-14-D01D-SFW	FD	537522		W	X
RR-11B-D01N-SFW	SA	537523		W	X
LR-11A-D01N-SFW	SA	537524		W	X
ERLIN-D01N-SFW	SA	537525		W	X

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The analytical results presented in the enclosed submittal represent re-analyses performed for surface water samples collected in March. These samples were re-analyzed for dissolved Aluminum, dissolved Arsenic and dissolved Cadmium with no dilutions to achieve the lowest possible reporting limit.

Although the laboratory case narrative stated that RR-1-T01N-SFW (Lab ID #537516) was included in the data package, there were no results for this sample. It is likely that the field ID RR-1-T01N-SFW was included in the case narrative in error as re-analyses were only required for the dissolved fraction and sample RR-1-T01N-SFW was not included on the CLP cover page for the data package.

In an e-mail exchange with Don Dawicki of STL Burlington, he stated that ERLIN-T01N-SFW (Lab ID #537525) was incorrectly labeled in the data package and that the correct ID is ERLIN-D01N-SFW. The data package has been hand-corrected to reflect the correct sample that was analyzed.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	N/A	
Holding Times	Yes	
Laboratory Blank Results	No	Aluminum was detected in the first continuing calibration blank. Table 1.1 summarizes the blank detection and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any matrix spike, post-digestion spike or laboratory duplicates. The matrix QC analyses for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Method QC • Surrogates • Serial Dilution RR-SPRING39-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	None of the three metals for the serial dilution analysis on sample RR-US-SPRING39-D01N-GRW were applicable, as all initial sample results were not sufficiently larger (x50) than the IDL (adjusted for dilution).
Field QC • Field Duplicates RR-14-D01D-SFW • Rinsate Blank • Field Blank • Trip Blank	No	The results for RR-14-D01D-SFW field duplicate did not satisfy the concentration-dependent evaluation criteria outlined in SOP 12.1. Table 1.2 summarizes the field duplicate and the resultant data qualifications. This package did not include any rinsate, field or trip blanks. The field duplicate results for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Nondetect Results w/ Elevated RLs?	N/A	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	Yes	Although the laboratory case narrative stated that RR-1-T01N-SFW (Lab ID #537516) was included in the data package, there were no results for this sample. It is likely that the field ID RR-1-T01N-SFW was included in the case narrative in error as re-analyses were only required for the dissolved fraction and sample RR-1-T01N-SFW was not included on the CLP cover page for the data package.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Blank Detection Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	CCB1 (µg/l)	IDL	Samples Qualified	Qualification code
Aluminum (P)	77.9	63.1	RR-US-SPRING39-D01N-SFW RR-DS-SPRING39-D01N-SFW RR-18A-D01N-SFW RR-17-D01N-SFW RR-18B-D01N-SFW RR-16-D01N-SFW	U CCB-I

P=ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table is limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Field Duplicate Results Outside Evaluation Criteria and Resultant Data Qualification

Sample	Analyte	Concentrations (µg/L)	RL	Evaluation Criterion	Qualification Code
RR-14-D01N-SFW RR-14-D01D-SFW	Aluminum	120 323	200	Difference <2xRL	J FD-I

RL= Reporting Limit (the Contract Required Detection Limit [CRDL] is used as the RL for duplicate evaluations.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WATRAS3 Sampling Event: SFW Re-analyses

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 09/11/03

Peer Reviewer: Stacey Coker Date Completed: 09/12/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[(2)]	Matrix	Analysis
					Metals
ERLMID-D01N-SFW	SA	537526		W	X
RR-10-D01N-SFW	SA	537527		W	X
RR-13-D01N-SFW	SA	537528		W	X
LR-1-D01N-SFW	SA	537529		W	X
RR-11C-D01N-SFW	SA	537530		W	X
RR-8-D01N-SFW	SA	537531		W	X
ONFH-T01N-SFW	SA	537532		W	
ONFH-D01N-SFW	SA	537533		W	X
RR-12-D01N-SFW	SA	537534		W	X
RR-11A1-D01N-SFW	SA	537535		W	X
ERLOUT-D01N-SFW	SA	537536		W	X
RR-5-D01N-SFW	SA	537537		W	X
RR-15-D01N-SFW	SA	537538		W	X
RR-US-SPRING39-D01N-SFW	SA	537539	RR-US-SPRG39-D01N-SFW	W	X
RR-DS-SPRING39-D01N-SFW	SA	537540	RR-DS-SPRG39-D01N-SFW	W	X

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The analytical results presented in the enclosed submittal represent re-analyses performed for surface water samples collected in March. These samples were re-analyzed for dissolved Aluminum, dissolved Arsenic and dissolved Cadmium with no dilutions to achieve the lowest possible reporting limit.

Although the laboratory case narrative stated that ONFH-T01N-SFW (Lab ID #537532) was included in the data package, there were no results for this sample. It is likely that the field ID ONFH-T01N-SFW was included in the case narrative in error as re-analyses were only required for the dissolved fraction and sample ONFH-T01N-SFW was not included on the CLP cover page for the data package.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	N/A	
Holding Times	Yes	
Laboratory Blank Results	No	Aluminum was detected in the fourth continuing calibration blank. Table 1.1 summarizes the blank detection and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any matrix spike, post-digestion spike or laboratory duplicates.
Method QC • Surrogates • Serial Dilution ERLMID-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	None of the three metals for the serial dilution analysis on sample ERLMID-D01N-GRW were applicable, as all initial sample results were not sufficiently larger (x50) than the IDL (adjusted for dilution). The matrix QC analyses for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Field QC • Field Duplicates • Rinsate Blank • Field Blank • Trip Blank	N/A	This package did not include any field duplicates, rinsate blanks, field blanks or trip blanks. The field duplicate results for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Nondetect Results w/ Elevated RLs?	N/A	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Blank Detection Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	CCB4 (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	90.4	63.1	RR-US-SPRING39-D01N-SFW RR-DS-SPRING39-D01N-SFW	U CCB-I

P=ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table is limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA VALIDATION REPORT
FOR THE
SUMMER 2003 SURFACE WATER SAMPLING EVENT

Prepared for
Molycorp, Inc.
Questa, New Mexico

March 2004

URS

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140220

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Dilution Schemes / Non-Detects With Elevated RLs 3-1
3.2.2 Bicarbonate Alkalinity / Total Alkalinity Matrix Spike Analyses 3-1
3.2.3 Non-Valid Matrix Spikes 3-2
3.2.4 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Summary/Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-3
4.3 Serial Dilution Results 4-3

Section 5 Collective Summary/Assessment of Field QC Results 5-1

5.1 Field Duplicate Results 5-1
5.2 Rinsate Blank Results 5-1
5.3 Field Blank Results 5-2

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-1
6.4 Representativeness 6-2
6.5 Comparability 6-2
6.6 Sensitivity 6-2

List of Attachments

Attachment 1.1 Data Review Summary for Data Package WAT132S

Attachment 1.2 Data Review Summary for Data Package WAT133S

Attachment 1.3 Data Review Summary for Data Package WAT134S

Attachment 1.4 Data Review Summary for Data Package WAT135S

Attachment 1.5 Data Review Summary for Data Package WAT138S

TABLE OF CONTENTS

Attachment 1.6	Data Review Summary for Data Package WAT139S
Attachment 1.7	Data Review Summary for Data Package WAT141A
Attachment 1.8	Data Review Summary for Data Package WAT142S
Attachment 1.9	Data Review Summary for Data Package WAT143S
Attachment 1.10	Data Review Summary for Data Package WAT150S
Attachment 1.11	Data Review Summary for Data Package WAT151C

This report contains the results of the data validation conducted for 56 surface water samples and associated quality control (QC) samples collected during the Summer 2003 Surface Water sampling event as part of the Molycorp RI/FS.

The surface water samples were sent to STL Burlington, in Colchester, Vermont for metals and inorganic analyses. The results were reported in eleven data packages (WAT132 thru WAT135, WAT138, WAT139, WAT141 thru WAT143, non-ISCO samples in WAT150S, and WAT151). All samples were analyzed for total metals, dissolved metals, and inorganic parameters (aqueous media) as defined in the RI/FS QAPP. This data validation report describes the data validation process used and presents the data review results for the surface water and associated QC samples submitted to STL for chemical analysis. The field sample IDs and associated data package numbers are provided in table below.

Data Package	Field ID Recorded on COC[1]	QC Designation
WAT132S	LR-13-T01N-SFW	SD
	LR-13-T01D-SFW	FD to LR-13-T01N-SFW
	LR-11A-T01N-SFW	
	LR-16-T01N-SFW	
WAT133S	LR-1-T01N-SFW	SD
	CD-1-T01N-SFW	
	ND-1-T01N-SFW	
	LR-4-T01N-SFW	
	RR-15-T01N-SFW	
	RR-11B-T01N-SFW	
	SD-1-T01N-SFW	
	RR-8-T01N-SFW	
	RR-20-T01N-SFW	
WAT134S	RR-10A1-T01N-SFW	
	RR-11A1-T01N-SFW	
	RR-10-T01N-SFW	
	RR-17-T01N-SFW	
	RR-16-T01N-SFW	SD, MS, PDS, LD
	LR-8A-T01N-SFW	
	RR-12-T01N-SFW	
	RR-13-T01N-SFW	
	RR-11C-T01N-SFW	
	RR-11C-T01D-SFW	FD to RR-11C-T01N-SFW
WAT135S	LR-5-T01N-SFW	SD
	RR-14-T01N-SFW	
	RR-6A-T01N-SFW	
	RR-7-T01N-SFW	
	RR-8A-T01N-SFW	
	RR-8A-T01D-SFW	FD to RR-8A-T01N-SFW

Data Package	Field ID Recorded on COC[1]	QC Designation
WAT138S	RR-4-T01N-SFW	SD
	RR-5-T01N-SFW	
	CABD4-T01N-SFW	
	RRS-27-T01N-SFW	
	RR-18A-T01N-SFW	
	RR-18B-T01N-SFW	
	RR-1-T01N-SFW	
	ZWERGEL-T01N-SFW	
	RRS-20-T01N-SFW	
	RRS-23-T01N-SFW	
WAT139S	RR-6-T01N-SFW	
	RRS-12-T01N-SFW	
	RR-3-T01N-SFW	SD, MS, PDS, LD
	RR-6V-T01N-SFW	
	RRS-9-T01N-SFW	
	RRS-15-T01N-SFW	
WAT141A	HANSEN CREEK-T01N-SFW	SD
WAT142S	ERLMID-T01N-SFW	
	ERLIN-T01N-SFW	
	UFLOUT-T01N-SFW	
	UFLMID-T01N-SFW	SD, MS, PDS, LD
	UFLIN-T01N-SFW	
	ERLOUT-T01N-SFW	
WAT143S	UPPERCABRESTO-T01N-SFW	SD
	RRS-13-T01N-SFW	
WAT150S	RR-US-SPRING13-T01N-SFW	
	RR-DS-SPRING13-T01N-SFW	SD
	RR-US-SPRING39-T01N-SFW	
	RR-DS-SPRING39-T01N-SFW	
WAT151C	STORM1-T01N-SFW	

FD = Field Duplicate MS = Matrix Spike

SD = Serial Dilution PDS = Post-Digestion Spike LD = Laboratory Duplicate

[1] "T01N" and "T01D" portion of the field ID were replaced with "D01N" and "D01D" respectively for the dissolved metals analyses

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate or spike duplicate analysis, post-digestion spike recoveries, ICP serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, rinsate blanks, field blanks, and trip blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1 and is as follows: if no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used; if no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used; if no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

In all cases of professional judgement exercised in evaluating the need for qualification, the basis for the professional judgement used is provided in the data review narrative. Section 3.0 provides the data review narratives for each of the data packages.

The site-specific matrix spike/matrix spike duplicate (MS/MSD) results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of

that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (MS/MSD results, laboratory duplicate results, and serial dilution results) and associated sample qualification. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

3.1 DATA REVIEW NARRATIVES

A sample-specific review was conducted on all packages which are included as Attachments 1.1 through 1.11. The data qualifiers, reason codes, and bias codes were marked on the data sheets, which are retained in the project files. The data validation qualifiers, reason codes, and bias codes are also stored in the electronic database.

During the data review process, several issues were identified which globally affected all relevant water samples analyzed for the Summer 2003 Surface Water sampling event. Although these issues may have been addressed in the individual summary reports, it was necessary to reiterate them in this collective assessment.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identified whether findings globally affect all relevant water samples analyzed for the May 2003 Groundwater and Surface Water Sampling Event. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

3.2.1 Dilution Schemes / Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

During the project, the need to analyze all surface water samples without dilution, regardless of pH, was identified. As such, surface water samples were generally analyzed without dilution, unless dilution was necessary based on analyte concentrations present in the sample.

3.2.2 Bicarbonate Alkalinity / Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgement, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the analyses. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix

spike recovery data for bicarbonate and total alkalinity were not considered an appropriate measure for assessing accuracy of the analysis.

3.2.3 Non-Valid Matrix Spikes

There were a total of three scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample-specific matrix effects. First, when native sample concentrations were greater than or equal to four times the spiking concentration, the ability to determine accuracy in the analysis was not accurate as the difference in the spike level with the original analyte concentration was not so discernable due to high concentration levels. In addition, there were several instances in which the reporting limits for various metal analytes were increased due to dilution factors, which affected the reliable quantitation of several spiked metals. In these situations, the reporting limit was greater than the spike concentration added. Related to this scenario, is the last instance in which the difference between the RL concentration and the spike concentration was less than the RL value.

3.2.4 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL data packages WAT132S and 150S were used to evaluate laboratory performance criteria. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0. The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries which are included in Attachment 1.

- Continuing Calibration Verification (CCV) results were reviewed in all metal results. No additional data qualification resulted, as all were either within the acceptance recovery range of 90-110% or were not applicable to any of the samples in the sequence run.
- Initial Calibration Verification (ICV) results were reviewed and no additional data qualification resulted.

The site-specific matrix spike (MS) results, laboratory duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analysis, LD analyses, and the serial dilution results for the samples collected during the sampling event.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

The table below illustrates the site-samples that were used to prepare matrix spike samples. As three matrix spikes were prepared and analyzed for metals, dissolved metals, and inorganic parameters at 56 field sample sites (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
RR-16-T01N-SFW	Surface Water	WAT134S	Metals and Inorganic Parameters
RR-16-D01N-SFW	Surface Water		Dissolved Metals
RR-3-T01N-SFW	Surface Water	WAT139S	Metals and Inorganic Parameters
RR-3-D01N-SFW	Surface Water		Dissolved Metals
UFLMID-T01N-SFW	Surface Water	WAT142S	Metals and Inorganic Parameters
UFLMID-D01N-SFW	Surface Water		Dissolved Metals

A number of spike recoveries were outside of the QC acceptance limits of 75%-125%. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries and the magnitude of outages.

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the matrix spike results that were outside of acceptance limits were caused by the sample matrix, a bias in the analytical system, or a combination of both. Recoveries for nearly all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

The table below summarizes the results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Analyte	Total				Dissolved				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Aluminum	3	0	0	107.0	3	0	0	103.8	None
Antimony	3	0	0	95.0	3	0	0	96.0	None
Arsenic	3	0	0	88.9	3	0	0	89.2	None
Barium	3	0	0	99.0	3	0	0	98.4	None
Beryllium	3	0	0	101.4	3	0	0	100.8	None
Boron	3	0	0	101.1	3	0	0	100.9	None

Analyte	Total				Dissolved				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Cadmium	3	0	0	91.9	3	0	0	91.8	None
Chromium	3	0	0	103.0	3	0	0	102.5	None
Cobalt	3	0	0	100.9	3	0	0	100.6	None
Copper	3	0	0	99.5	3	0	0	105.8	None
Iron	3	0	0	109.6	3	0	0	107.3	None
Lead	3	0	0	104.5	3	0	0	103.8	None
Manganese	3	0	0	102.1	3	0	0	101.2	None
Mercury	3	0	0	98.8	3	0	0	96.6	None
Molybdenum	3	0	0	98.6	3	0	0	100.9	None
Selenium	3	1	0	81.0	3	0	0	81.5	No qualification for parent sample because MS recovery of 74.8 rounds to 75% and PDS recovery 76.8% is within limits.
Nickel	3	0	0	99.2	3	0	0	100.0	None
Thallium	3	0	0	103.8	3	0	0	103.4	None
Silver	3	2	0	60.9	3	2	0	60.0	J/UJ MS-L for all sample results.
Vanadium	3	0	0	98.1	3	0	0	97.9	None
Zinc	3	0	0	103.3	3	0	0	102.9	None
Cyanide	3	0	0	87.4	NA				None
Chloride	3	0	0	102.0					None
Nitrate as N	3	0	0	101.2					None
Total Alkalinity	3	0	0	108.5					None
Fluoride	3	1	0	79.2					J/UJ MS-L for all sample results.
Ammonia	3	1	0	83.0					UJ MS-L for parent sample (UFLMID-T01N-SFW).
TKN	3	0	0	100.0					None
Nitrite	3	0	0	104.9					None
Orthophosphate	3	0	0	91.2					None
Phosphorus	3	0	0	99.2					None
Sulfate	3	1	0	79.5					J MS-L for parent sample (UFLMID-T01N-SFW).
BOD_5	3	0	0	101.0					None
COD	3	0	0	107.1					None
TOC	3	0	0	103.6					None

With the exceptions of silver and fluoride, data qualification was limited to parent samples only. For silver and fluoride, the general bias direction suggested by the matrix spike results is low.

Ammonia and sulfate exhibited 1 of 3 valid spike results (33%) outside QC acceptance limits. However, data qualification of ammonia and sulfate were limited to the parent sample of the exceeding matrix spikes because the recoveries were close to the lower recovery QC acceptance limit (72.5% and 72.6%, respectively) and the average recovery was within QC acceptance limits. Fluoride also exhibited 1 of 3 valid spike results (33%) outside QC acceptance limits. However, data qualification of fluoride was applied for all sample results due to the exceedingly low recovery (27.5%) and because fluoride is considered an important site related indicator parameter. Therefore, a conservative approach was applied for fluoride.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

The table below illustrates the site-samples that were used to prepare laboratory duplicate samples. As three laboratory duplicates were prepared and analyzed for inorganic parameters, metals and dissolved metals for 56 field sample sites (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
RR-16-T01N-SFW	Surface Water	WAT134S	Metals and Inorganic Parameters
RR-16-D01N-SFW	Surface Water		Dissolved Metals
RR-3-T01N-SFW	Surface Water	WAT139S	Metals and Inorganic Parameters
RR-3-D01N-SFW	Surface Water		Dissolved Metals
UFLMID-T01N-SFW	Surface Water	WAT142S	Metals and Inorganic Parameters
UFLMID-D01N-SFW	Surface Water		Dissolved Metals

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤20% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL. For metals data, the CRDL is used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL and the IDL was considered to be too low to be used as the baseline for these concentration dependent evaluations.

With one exception, the relative percent differences (RPDs) or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within QAPP acceptance limits. The exception and the resultant data qualifier is summarized in the table below.

Analyte	Sample ID	Criterion	Criterion Exceedance	Action
Iron	UFLMID-T01N-SFW	$\lvert$Diff$\rvert$<CRDL	1.06xCRDL	J D-I for parent sample only.

Qualification was limited to parent sample because only one of six results were outside QC acceptance limits and exceedance was small.

4.3 SERIAL DILUTION RESULTS

Serial dilution tests involve the analysis of a sample and a five-fold dilution of the same sample. When analyte concentrations are sufficiently high (i.e., greater that 50x the instrument detection limit [IDL]), the original result and diluted sample result are expected to be fairly comparable. If the results are not comparable, it is generally assumed that there are matrix interferences that are resulting in the suppression of elevation of the signal for one or more analytes.

The original and diluted sample results are compared by a percent difference (%D). When %Ds <10% are obtained, it can be ascertained that there aren't any significant matrix related

interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate that the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result. As illustrated by the table below, serial dilution tests were conduced on three surface water sample sets, with an additional six samples having serial dilution tests performed on only the total metals fraction of the sample.

Sample ID	Matrix	Data Package	Analyses
LR-13-T01N-SFW	Surface Water	WAT132S	Metals
LR-1-T01N-SFW	Surface Water	WAT133S	Metals
RR-16-T01N-SFW	Surface Water	WAT134S	Metals
RR-16-D01N-SFW	Surface Water	WAT134S	Dissolved Metals
LR-5-T01N-SFW	Surface Water	WAT135S	Metals
RR-4-T01N-SFW	Surface Water	WAT138S	Metals
RR-3-T01N-SFW	Surface Water	WAT139S	Metals
RR-3-D01N-SFW	Surface Water	WAT139S	Dissolved Metals
HANSEN CREEK-T01N-SFW	Surface Water	WAT141A	Metals
UFLMID-T01N-SFW	Surface Water	WAT142S	Metals
UFLMID-D01N-SFW	Surface Water	WAT142S	Dissolved Metals
UPPERCABRESTO-T01N-SFW	Surface Water	WAT143S	Metals

A number of %Ds between the original sample results and the result obtained from a sample diluted 1:5 were >10%. In general, qualification was generally limited to the parent samples if less than a quarter of the valid serial dilution results for a given metal were outside of the acceptance range. Conversely, qualification was generally considered necessary if more than a quarter of the results for a metal were outside the acceptance range. However, factors such as the number of valid measurements relative to the size of the sample set and the magnitude of outages were also taken into consideration. The table below summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued.

Analyte	Total Metals					Dissolved Metals					Action
	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		
				Low	High				Low	High	
Aluminum	4	0	2.0	0	0	3	0	1.5	0	0	None
Antimony	3	0	6.4	0	0	3	0	6.1	0	0	None
Arsenic	2	2	13.3	2	0	2	1	9.3	1	0	UJ DL-L for parent samples only (RR-16-T01N-SFW, RR-16-D01N-SFW, UFLMID-T01N-SFW).
Barium	3	0	1.5	0	0	3	0	0.8	0	0	None
Beryllium	3	0	1.7	0	0	3	0	1.0	0	0	None
Boron	3	0	2.7	0	0	3	0	1.1	0	0	None

Analyte	Total Metals					Dissolved Metals					Action
	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		
				Low	High				Low	High	
Cadmium	2	2	13.1	2	0	2	0	8.7	0	0	J/UJ DL-L for parent samples only (RR-16-T01N-SFW, UFLMID-T01N-SFW).
Calcium	8	0	1.8	0	0	3	0	1.3	0	0	None
Chromium	3	0	2.4	0	0	3	0	1.9	0	0	None
Cobalt	3	0	1.3	0	0	3	0	1.1	0	0	None
Copper	3	1	10.6	1	0	3	0	3.0	0	0	J DL-L for parent sample only (RR-3-T01N-SFW).
Iron	1	0	2.0	0	0	1	0	5.2	0	0	None
Lead	3	1	71.7	1	0	3	0	1.5	0	0	J DL-L for parent sample only (RR-3-T01N-SFW).
Magnesium	4	0	2.6	0	0	0					None
Manganese	7	0	2.5	0	0	3	0	0.7	0	0	None
Molybdenum	3	0	3.1	0	0	3	0	1.0	0	0	None
Selenium	0					0					None
Nickel	3	1	11.8	1	0	3	0	2.7	0	0	J DL-L for parent sample only (RR-3-T01N-SFW).
Potassium	0					0					None
Thallium	3	0	0.5	0	0	3	0	1.0	0	0	None
Silver	2	0	5.7	0	0	2	0	5.2	0	0	None
Sodium	0					0					None
Vanadium	3	0	0.8	0	0	3	0	1.1	0	0	None
Zinc	5	1	11.1	1	0	3	0	2.3	0	0	J DL-L for parent sample only (LR-1-T01N-SFW).

Arsenic, cadmium, copper, lead, nickel and zinc exhibited valid serial dilution results, as well as average differences, outside QC acceptance limits. For copper, nickel, and zinc, only one serial dilution result was >10%D, and the associated parent sample data have been qualified as estimated. For lead, the high average %D is skewed by one anomously high %D of 213%. Eliminating this point results in an average %D <10%, and only the associated parent sample data have been qualified. For arsenic and cadmium, qualification was limited to the parent samples because the number of valid serial dilution results was low (4 vs. 104 total metals and dissolved metals analyses) and the outages were minimal (i.e., %Ds <15%).

The site-specific blanks (field and rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

5.1 FIELD DUPLICATE RESULTS

The table below presents the field duplicates collected for this event. As three field duplicate sample pairs were prepared and analyzed for metals, dissolved metals, and inorganic parameters for 56 field sample sites (excluding the field duplicate samples), the QAPP frequency for field duplicate QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
LR-13-T01D-SFW	Surface Water	WAT132S	Metals and Inorganic Parameters
LR-13-D01D-SFW	Surface Water	WAT132S	Dissolved Metals
RR-11C-T01D-SFW	Surface Water	WAT134S	Metals and Inorganic Parameters
RR-11C-D01D-SFW	Surface Water	WAT134S	Dissolved Metals
RR-8A-T01D-SFW	Surface Water	WAT135S	Metals and Inorganic Parameters
RR-8A-D01D-SFW	Surface Water	WAT135S	Dissolved Metals

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤30% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For field duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than two times the greater RL. For metals data, the CRDL is used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL and the IDL was considered to be too low to be used as the baseline for these concentration dependent evaluations. With one exception, the applicable evaluation criterion was met. The exception and the resultant data qualifier is summarized in the table below.

Analyte	Sample ID	Criterion	Criterion Exceedance	Action
Orthophosphate	RR-11C-T01N/T01D-SFW	$\lvert$Diff$\rvert$ <2xRL	45xRL	J/UJ FD-I for parent sample only.

Qualification was limited to parent sample because only one of three results were outside QC acceptance limits and the orthophosphate was qualified as estimate based on total versus partial disagreement. Therefore, the result is suspect and can not be used to assess a systematic trend.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Three surface water rinsate blanks were collected during this sampling event. The rinsate blanks were given field IDs of RB01T-SFW through RB03T-SFW. As three rinsate blanks were prepared and analyzed for

metals and inorganic parameters for 56 field sampling sites, the QAPP frequency for rinsate blank QC samples (5%) was satisfied.

The rinsate blank detections results and the resulting data qualification issued is summarized in the following table. To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result or biasing the average high by using the reporting limit.

Analyte	Sample ID	Conc.	RL	Frequency of Detection	Average RB Concentration	Range for Field Samples	Number of Samples Qualified	Action
Metals (µg/L)								
Zinc	RB03T-SFW	4.7	1.0	1 of 3	1.9	1.6 to 3220	21	U RB-I for all sample results ≤9.5 µg/L
Inorganic Parameters (mg/L)								
Bicarbonate Alkalinity	RB01T-SFW	2.9	1.0	3 of 3	2.9	1 to 80.5	0	U RB-I for all sample results ≤14.5 mg/L
	RB02T-SFW	2.9						
	RB03T-SFW	2.8						
Chloride	RB02T-SFW	0.27	0.2	1 of 3	0.2	0.44 to 38.4	11	U RB-I for all sample results ≤1.35 mg/L
Fluoride	RB02T-SFW	0.81	0.1	1 of 3	0.3	0.1 to 5.1	50	U RB-I for all sample results ≤1.5 mg/L
Nitrate	RB01T-SFW	0.51	0.4	1 of 3	0.4	0.22 to 4.5	9	U RB-I for all sample results ≤2.0 mg/L
Total Alkalinity	RB01T-SFW	2.9	1.0	3 of 3	2.9	1 to 80.5	0	U RB-I for all sample results ≤14.5 mg/L
	RB02T-SFW	2.9						
	RB03T-SFW	2.8						
Total Dissolved Solids	RB03T-SFW	18	10	1 of 1[1]	18	70 to 3450	4	U RB-I for all sample results ≤90.0 mg/L
Total Suspended Solids	RB01T-SFW	0.5	0.5	1 of 3	0.3	1.2 to 22.2	6	U RB-I for all sample results ≤1.65 mg/L

In calculating the average rinsate blank concentration, one half of the RL was used for nondetect results.

[1] RB01T-SFW and RB02T-SFW Total Dissolved Solids concentrations were rejected on the basis of calculated TDS versus measured TDS.

While some results were qualified as non-detect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and at relatively low levels.

5.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field blanks are only required by the QAPP when samples are analyzed for organics. Therefore, no field blanks were collected in association with the surface water samples collected during this sample event.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as estimated on the basis of the MS/MSD results, serial dilution results, field duplicate results, or holding time exceedances. A general overall assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

Approximately 98% of the field duplicate and laboratory results satisfied the applicable criteria. As such, the overall level of precision demonstrated is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of LCSs and MS/MSDs.

All of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP, which is considered to be indicative of acceptable overall accuracy with respect to the analytical system.

The matrix spike recoveries suggested that the overall accuracy attained with respect to the site-specific sample matrix is satisfactory as 95% of the matrix spike recoveries were within the QAPP acceptance range of 75-125%. Sample results were qualified accordingly as estimated due to low or high matrix spike recoveries.

However, the serial dilution results suggested that very few surface water results might be biased as low because 6.5% of the applicable results did not satisfy the evaluation criterion of a %D<10%. The average percent difference over all applicable serial dilution results was 4.9%. As noted in the data review narrative and the discussion in Section 4, the results have been qualified accordingly.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results for the 59 samples analyzed (56 field samples and 3 field duplicates) are considered usable as qualified for meeting project objective. As such, the completeness for the samples analyzed is 100%, which satisfies the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the surface water samples. The close agreement between the field duplicate results is considered to indicate that the samples collected are adequately representative of the medium sampled. Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. As noted in Section 6.1, 98% of the laboratory duplicate results satisfied the precision evaluation indicating that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

All RLs obtained met the QAPP specified RL requirements for solid media for which there was screening level criteria provided in the QAPP or the Baseline Ecological Risk Assessment to which RLs for nondetect analytes could be compared.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT132S

Sampling Event: Summer 2003 SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

LP Reviewer: Brian Olmsted

Date Completed: 03/01/04

Data Reviewer: Karen Kronoveter

Date Completed: 09/15/03

Peer Reviewer: Stacey Coker

Date Completed: 11/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
LR-13-T01N-SFW	SA	534106	W	X	X
LR-13-D01N-SFW	SA	534107	W	X	
LR-13-T01D-SFW	FD	534108	W	X	X
LR-13-D01D-SFW	FD	534109	W	X	
LR-11A-T01N-SFW	SA	534110	W	X	X
LR-11A-D01N-SFW	SA	534111	W	X	
LR-16-T01N-SFW	SA	534112	W	X	X
LR-16-D01N-SFW	SA	534113	W	X	
RB04T-SED	RB	534114	W	X	X
RB05T-SED	RB	534115	W	X	X
RB06T-SED	RB	534115	W	X	X

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the laboratory case narrative are summarized in the appropriate sections in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As mentioned in the laboratory case narrative, the nitrate analysis for sample LR-13-T01N-SFW was performed 23 days beyond the prescribed analytical holding time of 48 hours, as this sample was inadvertently missed during the analysis of the other samples in this delivery group. It is noted that the result obtained was comparable to the nitrate result for the field duplicate. The detected sulfate concentration for this sample was qualified as estimated (J). Nitrate, nitrite, orthophosphate, and BOD_5 results for the majority of samples in this delivery group were qualified as estimated (J/UJ), as the prescribed analytical holding time of 48 hours was exceeded by several hours. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 21 days after sampling and 19 days beyond log-in. The pH for all samples was measured approximately 6.5 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	No	This package did not include any site-specific matrix quality control (QC) samples. The matrix quality control results for the Summer 2003 surface water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) LR-13-T01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	One serial dilution test was conducted on sample LR-13-T01N-SFW. The serial dilution results could not be used to assess potential interferences for 21 of the 24 metals analyzed by ICP since only three analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. As all %Ds for applicable metal analytes were less than 10%, no qualification was necessary on the basis of the serial dilution results. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate LR-13-D01D/D01N-SFW LR-13-T01D/T01N-SFW • Rinsate Blank RB04T-SED RB05T-SED RB06T-SED • Field Blank • Trip Blank	N/A	The results for the field duplicate samples reported in this package satisfied the applicable concentration dependent evaluation criteria and data qualification was not necessary. The field QC results for the Summer 2003 surface water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the individual overall assessments for surface water and sediment samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	N/A	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH	BOD_5
LR-13-T01N-SFW	0.22 J	0.0050 UJ	0.010 UJ	422 J	8.1 J	1.5 UJ
LR-13-T01D-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	430 J	8.1 J	1.5 UJ
LR-11A-T01N-SFW	0.40 UJ	---	0.010 UJ	423 J	7.9 J	---
LR-16-T01N-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	417 J	8.2 J	1.5 UJ
RB05T-SED	0.40 UJ	0.0050 UJ	0.010 UJ	0.0 J	5.1 J	---
RB06T-SED	0.40 UJ	0.0050 UJ	0.010 UJ	0.0 J	4.9 J	---
RB04T-SED	0.40 UJ	---	---	0.0 J	4.8 J	---

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P)	52.8/ 24.9	57.2/ 32.7	80.0/ 31.3	88.9	-29.91	18.3/ 23.6	All samples with the **exception** of: LR-11A-T01N-SFW LR-13-T01N-SFW	UJ MB,CCB-L U CCB-I UJ MB-L
Beryllium (P)	---	0.3	0.3	0.4	---	0.20	LR-13-T01D-SFW	U CCB-I
Chromium (P)	-1.8	-2.2	-2.1	-1.7	-1.566	0.6	All samples with the **exception** of: LR-13-T01N-SFW	UJ MB,CCB-L
Copper (P)	2.5	2.7	---	---	---	2.4	LR-13-T01N-SFW	U CCB-I
Iron (P)	24.3/ 37.2	23.1/ 33.6	32.8/ 44.4	---	---	16.8/ 33.3	LR-11A-T01N-SFW LR-13-T01D-SFW LR-13-T01N-SFW LR-16-T01N-SFW	U CCB-I
Mercury (CV)	---	---	---	---	0.160	0.10	All samples with the **exception** of: LR-13-T01N-SFW LR-16-D01N-SFW	U MB-I
Zinc (P)	-8.6	-9.7	-9.8	---	---	1.0	LR-13-T01N-SFW	J CCB-L

P=ICP CV=Cold Vapor CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

There were multiple runs for the ICP metals, on multiple instruments, therefore multiple detected concentrations may be reported per CCB/MB. The run logs verified the samples associated with the specific blank detections and were qualified accordingly.

All ICP samples were run on ICP 6, with the exception of sample LR-13-T01N-GRW, which was run on ICAP 4 on 08/20/03.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT133S

Sampling Event: Summer 2003 SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 09/24/03

Peer Reviewer: Stacey Coker

Date Completed: 11/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses			
				Metals	Inorganics	BOD	COD
LR-1-T01N-SFW	SA	534237	W	X	X	X	X
LR-1-D01N-SFW	SA	534238	W	X			
CD-1-T01N-SFW	SA	534239	W	X	X	X	X
CD-1-D01N-SFW	SA	534240	W	X			
RB01T-SFW	RB	534241	W	X	X	X	X
RB02T-SFW	RB	534242	W	X	X	X	X
ND-1-T01N-SFW	SA	534243	W	X	X	X	X
ND-1-D01N-SFW	SA	534244	W	X			
LR-4-T01N-SFW	SA	534245	W	X	X	X	X
LR-4-D01N-SFW	SA	534246	W	X			
RR-15-T01N-SFW	SA	534247	W	X	X	X	X
RR-15-D01N-SFW	SA	534248	W	X			
RR-11B-T01N-SFW	SA	534249	W	X	X	X	X
RR-11B-D01N-SFW	SA	534250	W	X			
SD-1-T01N-SFW	SA	534251	W	X	X	X	X
SD-1-D01N-SFW	SA	534252	W	X			
RR-8-T01N-SFW	SA	534253	W	X	X	X	X
RR-8-D01N-SFW	SA	534254	W	X			
RR-20-T01N-SFW	SA	534255	W	X	X	X	X
RR-20-D01N-SFW	SA	534256	W	X			

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted the Initial Calibration Verification (ICV) associated with the ICPMS analysis of sample LR-1-T01N-SFW had an elevated response for antimony (113.6%, with a control limit of 90-110%). Sample LR-1-T01N-SFW, associated with this calibration verification, reported antimony above the Reporting Limit (RL) of 0.50 µg/L, not below, as stated in the laboratory case narrative. The antimony result for this sample was not qualified, as it was already qualified as nondetect due to the presence of antimony in a Continuing Calibration Blank (CCB). Data qualification was not considered necessary because LR-1-T01N-SFW was analyzed between CCVs 4 and 5, for which acceptable recoveries were obtained. Additionally, silver recoveries in the other CCVs (1-3) were acceptable.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The original nitrate analyses were analyzed several hours beyond the prescribed analytical holding time of 48 hours. The laboratory case narrative noted there was a malfunction of the instrument that resulted in the introduction of air into the system. Consequently, the associated continuing calibration verification analyses exhibited elevated recoveries indicating a potential high bias in the analytical results. The nitrate samples were re-analyzed 22 days beyond the resolution of instrument issues. The original nitrate results were reported, as the results were generally comparable between the two sequences. As all nitrate analyses were several hours beyond the 48 hours holding time, all results for nitrate were qualified as estimated (J/UJ) with an indeterminate bias direction. Additionally, the 48-hour holding times for the majority of nitrite and orthophosphate, and BOD_5 samples were exceeded by several hours. Accordingly, analyses run outside of the holding time were qualified as estimated (UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 21 days beyond log-in. The pH for all samples was measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). As noted in the laboratory case narrative, the original chloride analyses (method 300.0) of samples LR-4-T01N-SFW, RR-15-T01N-SFW. RR-11B-T01N-SFW, SD-1-T01N-SFW, RR-8-T01N-SFW, and RR-20-T01N-SFW were accomplished within an analytical run for which a continuing calibration verification (CCV) standard did not meet quality control criteria. Accordingly, these samples were reanalyzed one day beyond the prescribed analytical holding time of 28 days. The chloride results for the reanalyses samples were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the Summer 2003 Surface Water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (C) LR-1-T01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	No	One serial dilution test was conducted on sample LR-1-T01N-SFW. The serial dilution results could not be used to assess potential interferences for 21 of the 24 metal analytes, as only three analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. As the %D for zinc was 45.8%, the zinc result for the parent sample was qualified as estimated (J), with a low bias direction. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. No qualification of data was necessary on the basis of cation/anion imbalance. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5. Upon review of the rinsate blank results, the reported TDS values appeared unusually high. The TDS values were calculated independently for each sample, resulting in TDS ratios of 0.05 for sample RB01T-SFW and 0.03 for RB02T-SFW. Accordingly, the TDS results for the two rinsate blanks were rejected on the basis of total vs partial imbalances. The results could not be used to infer potential contaminants with any degree of confidence.
Field QC • Field Duplicate • Rinsate Blank RB01T-SFW RB02T-SFW • Field Blank • Trip Blank	N/A	The field QC results for the Summer 2003 Surface Water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (N) (mg/L)	Nitrite (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)	BOD_5 (mg/L)	Chloride (mg/L)
LR-1-T01N-SFW	0.40 UJ	---	---	367 J	7.6 J	---	---
CD-1-T01N-SFW	0.50 J	---	---	343 J	7.8 J	---	---
RB01T-SFW	0.51 J	---	---	0.00 J	6.5 J	---	---
RB02T-SFW	0.40 UJ	---	---	0.00 J	5.4 J	1.5 UJ	---
ND-1-T01N-SFW	0.41 J	0.0050 UJ	0.010 UJ	291 J	7.7 J	1.5 UJ	---
LR-4-T01N-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	367 J	7.4 J	1.5 UJ	3.3 J
RR-15-T01N-SFW	0.58 J	0.0050 UJ	0.010 UJ	335 J	7.7 J	1.5 UJ	2.8 J
RR-11B-T01N-SFW	0.41 J	---	---	285 J	7.6 J	1.5 UJ	2.5 J
SD-1-T01N-SFW	1.0 UJ	0.0050 UJ	0.010 UJ	331 J	7.7 J	1.5 UJ	2.7 J
RR-8-T01N-SFW	0.40 UJ	---	---	263 J	8.3 J	1.5 UJ	2.6 J
RR-20-T01N-SFW	0.40 UJ	---	---	362 J	7.4 J	---	3.3 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	CCB7 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P)	---	---	-43.5	-23.9	---	---	---	---	23.6	LR-4-D01N-SFW RR-20-D01N-SFW	UJ CCB-L J CCB-L
Antimony (MS)	0.7/ 0.6	0.6/ 1.4	0.7/ 1.2	---/ 1.0	0.9/ 0.8	---/ 0.7	---/ 0.7	---	0.5	LR-1-T01N-SFW	U CCB-I
Beryllium (P)	---	---	0.2	---	---	---	---	---	0.20	ND-1-T01N-SFW RR-11B-D01N-SFW RR-11B-T01N-SFW RR-15-D01N-SFW RR-15-T01N-SFW RR-20-T01N-SFW SD-1-D01N-SFW SD-1-T01N-SFW	U CCB-I
Sodium (P)	---	---	---	---	---	---	---	542.2	472.7	RB02T-SFW	U MB-I
Vanadium (MS)	---/ 0.2	---/ 0.6	0.6/ ---	0.5/ 0.5	0.7/ 0.3	---/ ---	---/ 0.2	0.2/ 0.2	0.20	All samples	U CCB-I
Zinc (P)	---	---	---	---	---	---	---	2.155	1.0	RB01T-SFW RB02T-SFW RR-8-D01N-SFW	U MB-I

P=ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

There were multiple runs for the MS metals, therefore multiple detected concentrations may be reported per CCB/MB.

The run logs were used to determine the samples associated with the specific blank detections and qualification was issued accordingly.

All MS samples were run on 08/25/03, with the exception of sample LR-1-T01N-SFW, which was run on 08/22/03.

The first detected concentration for Sb and V are associated with the 08/25/03 run.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT134S

Sampling Event: July 2003 SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: B.Olmsted/K.Kronoveter

Date Completed: 09/12/03

Peer Reviewer: S.Coker/A. Roberts

Date Completed: 10/14/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses			
				Metals	Inorganics	BOD	COD
RR-10A1-T01N-SFW	SA	534280	W	X	X	X	X
RR-10A1-D01N-SFW	SA	534281	W	X			
RR-11A1-T01N-SFW	SA	534282	W	X	X	X	X
RR-11A1-D01N-SFW	SA	534283	W	X			
RR-10-T01N-SFW	SA	534284	W	X	X	X	X
RR-10-D01N-SFW	SA	534285	W	X			
RR-17-T01N-SFW	SA	534286	W	X	X	X	X
RR-17-D01N-SFW	SA	534287	W	X			
RR-16-T01N-SFW	SA	534288	W	X	X	X	X
RR-16-D01N-SFW	SA	534289	W	X			
LR-8A-T01N-SFW	SA	534290	W	X	X	X	X
LR-8A-D01N-SFW	SA	534291	W	X			
RR-12-T01N-SFW	SA	534292	W	X	X	X	X
RR-12-D01N-SFW	SA	534293	W	X			
RR-13-T01N-SFW	SA	534294	W	X	X	X	X
RR-13-D01N-SFW	SA	534295	W	X			
RR-11C-T01N-SFW	SA	534296	W	X	X	X	X
RR-11C-D01N-SFW	SA	534297	W	X			
RR-11C-T01D-SFW	FD	534298	W	X	X	X	X
RR-11C-D01D-SFW	FD	534299	W	X			

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

Cation/Anion balances for the samples in this delivery group were evaluated in order to check the correctness of the analyses as referenced in method SM 1030 F. All samples within this delivery group exhibited ion balance percent differences that were within the validation limits set by the client. In addition, the ratios of calculated versus measured total dissolved solids (TDS) were within the validation limits.

The original Nitrate analyses for the samples in this delivery group were accomplished within the prescribed analytical holding time on the day that they were received. However, due to a malfunction of the instrument that resulted in the introduction of air into the system, the associated continuing calibration verification analyses exhibited elevated recoveries indicating a potential high bias in the analytical results. These samples were re-analyzed in an acceptable sequence 2 days beyond the prescribed analytical holding time. Results from the re-analyses are presented in this submittal.

Due to a misidentification by the ion chromatography software, the 0.2 mg/l calibration point for Nitrate could not be used in the calibration associated with the analysis of the samples in this delivery group. Therefore, results were calculated manually with this calibration point omitted. This resulted in the elevation of the reporting limit to 0.5 mg/l for these samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time for nitrate, nitrite, orthophosphate and BOD were exceeded by several hours for all samples resulting in qualification as estimate (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival to the laboratory. Conductivity measurements for all samples were taken 20 days after sampling and 18 days beyond login. The pH for all samples were measured 7 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value with a bias direction of indeterminate.
Matrix QC • MS/MSD RR-16-T01N-SFWS RR-16-D01N-SFWS • PDS RR-16-T01N-SFWA RR-16-D01N-SFWA • LD RR-16-T01N-SFWD RR-16-D01N-SFWD	No	Silver was recovered in the matrix spike analysis of sample RR-16-T01N-SFW and RR-16-D01N-SFW below the control criteria of 75-125% but greater than 30%, suggesting a potential low bias in the reporting of these analytes in samples. Table 1.3 summarizes the results. Post digestion spikes were performed on the metal analytes that did not meet the specified criterion for the initial matrix spike recoveries. All post digestion spike recoveries for these analytes were within acceptance limits and did not therefore require qualification on this basis. For all analyses, no qualification of data was necessary on the basis of laboratory duplicate criteria. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the DVR.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (A) RR-16-T01N-SFWSL RR-16-D01N-SFWSL • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses on the matrix spike samples of RR-16-T01N-SFW and RR-16-D01N-SFW were applicable for 19 of the 24 metal analytes, as all initial sample results (with the exception of 5) were sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent differences (%Ds) between the initial sample results and the serial dilution results (5x) were compared to an evaluation criteria of ±10% for the 19 analytes. Table 1.4 summarizes the results not meeting the acceptance criteria. Two results for orthophosphate and phosphorus were qualified as estimate on the basis of total versus partial disagreement. Table 1.5 summarizes the results qualified along with the concentrations reported. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate RR-11C-T01D-SFW RR-11C-D01D-SFW • Rinsate Blank • Field Blank • Trip Blank	No	Orthophosphate analyses between field duplicate pairs RR-11C-T01D-SFW and RR-11C-T01N-SFW did not meet the acceptance criteria. Table 1.6 summarizes the results. This package did not include any trip, rinsate or field blanks. However, all field QC results will be evaluated collectively and any resultant data qualification will be discussed in the DVR for June 2003 sampling event.
Nondetect Results w/ Elevated RLs?	Yes	All instances of nondetect results with elevated RLs were due to results qualified as nondetect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)	BOD_5 (mg/L)
RR-10A1-T01N-SFW	1.0 UJ	0.0050 UJ	0.022 J	220 J	8.1 J	1.5 UJ
RR-11A1-T01N-SFW	1.0 UJ	0.0050 UJ	0.29 J	224 J	8.0 J	1.5 UJ
RR-10-T01N-SFW	1.0 UJ	0.0050 UJ	0.011 J	240 J	8.2 J	1.6 UJ
RR-17-T01N-SFW	1.0 UJ	0.0050 UJ	0.010 UJ	316 J	7.7 J	1.6 UJ
RR-16-T01N-SFW	1.0 UJ	0.0050 UJ	0.010 UJ	312 J	7.8 J	1.6 UJ
LR-8A-T01N-SFW	1.0 UJ	0.0050 UJ	0.010 UJ	422 J	7.8 J	1.6 UJ
RR-12-T01N-SFW	1.0 UJ	0.0050 UJ	0.010 UJ	299 J	7.6 J	1.6 UJ
RR-13-T01N-SFW	1.0 UJ	0.0050 UJ	0.017 J	305 J	6.8 J	1.6 UJ
RR-11C-T01N-SFW	1.0 UJ	0.0050 UJ	0.46 J	304 J	7.4 J	1.6 UJ
RR-11C-T01D-SFW	1.0 UJ	0.0050 UJ	0.010 UJ	309 J	7.5 J	1.6 UJ

Table 1.2
Blank Detections Outside Evaluation Criteria and Resultant Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (MS)	0.9	0.7	0.7	0.7	0.9	---	0.50	RR-16-D01N-SFW LR-8A-T01N-SFW	U CCB-I
Mercury (CV)	---	---	---	---	---	0.190	0.1	All Samples	U MB-I
Zinc (P)	---	---	---	---	---	7.003	1.6	RR-10A1-T01N-SFW RR-10A1-D01N-SFW RR-11A1-D01N-SFW RR-10-T01N-SFW RR-10-D01N-SFW	U MB-I

MB=Method Blank MS=Inductively Coupled-Mass Spectrometry CV=Manual Cold Vapor AA P= Inductively Coupled Plasma-Atomic Spectrometry CCBx=Continuing Calibration Blank RL=Reporting Limit IDL=Instrument Detection Limit

Note: Table is limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Comment	Action
RR-16-T01N-SFW					
Silver	33.4	82.5	75-125%	None	UJ MS-L for parent sample
RR-16-D01N-SFW					
Silver	33.3	82.0	75-125%	None	UJ MS-L for parent sample

Table 1.4
Serial Dilutions Results Not Meeting Acceptance Criteria and Data Qualification

Analyte	%D	Qualification
RR-16-T01N-SFW		
Arsenic	13.2	UJ DL-L
Cadmium	12.9	J DL-L
RR-16-D01N-SFW		
Arsenic	11.4	UJ DL-L

Table 1.5
Total vs. Partial Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Orthophosphate (mg/L)	Total Phosphorous (mg/L)	RL for both analytes (mg/L)	Criteria	Qualification Code
RR-11A1-T01N-SFW	0.29	0.030	0.010	$\lvert$Diff$\rvert$ <2xRL	J TvP-I
RR-11C-T01N-SFW	0.46	0.011		$\lvert$Diff$\rvert$ <2xRL	

RL = Reporting Limit

Table 1.6
Field Duplicate Results Not Meeting Acceptance Criteria and Data Qualification

Samples	Orthophosphate (mg/L)	RL (mg/L)	Criteria	Qualification Code
RR-11C-T01N-SFW	0.46	0.010	|Diff| <2xRL	J FD-I
RR-11C-T01D-SFW	0.010			UJ FD-I

RL = Reporting Limit

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT135S

Sampling Event: July 2003 GRW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 09/11/03

Peer Reviewer: Stacey Coker

Date Completed: 09/14/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[(1)]	Lab ID	Matrix	Analyses			
				Metals	Inorganics	BOD	COD
LR-5-T01N-SFW	SA	534257	W	X	X	X	X
LR-5-D01N-SFW	SA	534258	W	X			
RR-14-T01N-SFW	SA	534259	W	X	X	X	X
RR-14-D01N-SFW	SA	534260	W	X			
RR-6A-T01N-SFW	SA	534261	W	X	X	X	X
RR-6A-D01N-SFW	SA	534262	W	X			
RR-7-T01N-SFW	SA	534263	W	X	X	X	X
RR-7-D01N-SFW	SA	534264	W	X			
RR-8A-T01N-SFW	SA	534265	W	X	X	X	X
RR-8A-D01N-SFW	SA	534266	W	X			
RR-8A-T01D-SFW	FD	534267	W	X	X	X	X
RR-8A-D01D-SFW	FD	534268	W	X			

Matrix: W = Water RB = Rinsate Blank

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted that the 0.2 mg/L calibration point for nitrate could not be included in the calibration, due to a misidentification by the ion chromatography software. Accordingly, the laboratory calculated nitrate results manually, with this low-end calibration point omitted. This resulted in the increased nitrate reporting limit of 0.5 mg/L, as verified by the data sheets. These calculations are included in the raw data section of the data package. The quality and usability of the data was not affected, as the QAPP specifies a maximum reporting limit of 1.0 mg/L for nitrate.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the original nitrate analyses were accomplished within the prescribed analytical holding time of 48 hours. However, due to a malfunction of the instrument that resulted in the introduction of air into the system, the associated continuing calibration verification analyses exhibited elevated recoveries indicating a potential high bias in the analytical results. The nitrate samples were re-analyzed two days beyond the holding time and reported. Accordingly, all results for nitrate were qualified as estimated (UJ) with an indeterminate bias direction. The 48-hour holding times for the majority of nitrite and orthophosphate, and BOD_5 samples were exceeded by several hours. Accordingly, analyses run outside of the holding time were qualified as estimated (UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 21 days beyond log-in. The pH for all samples was measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) LR-5-T01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	One serial dilution test was conducted on sample LR-5-T01N-SFW. The serial dilution results could not be used to assess potential interferences for 20 of the 24 metal analytes, as only four analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. As all %Ds for applicable metal analytes were less than 10%, none of the results of this study could be used to evaluate the presence of physical or chemical matrix interferences. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. No qualification of data was necessary on the basis of cation/anion imbalance. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate RR-8A-T01N/T01D-SFW RR-8A-D01N/D01D-SFW • Rinsate Blank • Field Blank • Trip Blank	N/A	No field QC samples were analyzed with this data package. The field QC results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH	BOD5
LR-5-T01N-SFW	1.0 UJ	0.0050 UJ	0.010 UJ	377 J	7.5 J	1.5 UJ
RR-14-T01N-SFW	1.0 UJ	0.0050 UJ	0.010 UJ	329 J	7.7 J	1.5 UJ
RR-6A-T01N-SFW	1.0 UJ	---	---	262 J	7.9 J	---
RR-7-T01N-SFW	1.0 UJ	---	---	261 J	8.2 J	1.5 UJ
RR-8A-T01N-SFW	1.0 UJ	0.0050 UJ	0.010 UJ	263 J	8.4 J	1.5 UJ
RR-8A-T01D-SFW	1.0 UJ	0.0050 UJ	0.010 UJ	266 J	8.4 J	1.5 UJ

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Beryllium (P)	---	-0.2	---	---	---	23.6	LR-5-D01N-SFW LR-5-T01N-SFW RR-14-T01N-SFW	UJ CCB-L
Lead (P)	---	---	---	---	0.113	0.1	All samples with the **exception** of: RR-8A-T01N-SFW	U MB-I

P=ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT138S

Sampling Event: July 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 10/08/03

Peer Reviewer: Stacey Coker

Date Completed: 11/02/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses		
					BOD/COD	Metals	Inorganic
RR-4-T01N-SFW	SA	534514		W	X	X	X
RR-4-D01N-SFW	SA	534515		W		X	
RR-5-T01N-SFW	SA	534516		W	X	X	X
RR-5-D01N-SFW	SA	534517		W		X	
CABD4-T01N-SFW	SA	534518		W	X	X	X
CABD4-D01N-SFW	SA	534519		W		X	
RRS-27-T01N-SFW	SA	534520		W	X	X	X
RRS-27-D01N-SFW	SA	534521		W		X	
RR-18A-T01N-SFW	SA	534522		W	X	X	X
RR-18A-D01N-SFW	SA	534523		W		X	
RR-18B-T01N-SFW	SA	534524		W	X	X	X
RR-18B-D01N-SFW	SA	534525		W		X	
RR-1-T01N-SFW	SA	534526		W	X	X	X
RR-1-D01N-SFW	SA	534527		W		X	
ZWERGEL-T01N-SFW	SA	534528		W	X	X	X
ZWERGEL-D01N-SFW	SA	534529		W		X	
RRS-20-T01N-SFW	SA	534530		W	X	X	X
RRS-20-D01N-SFW	SA	534531		W		X	
RRS-23-T01N-SFW	SA	534532		W	X	X	X
RRS-23-D01N-SFW	SA	534533		W		X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

2 Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted that the 0.2 mg/L calibration point for nitrate as N could not be included in the calibration, due to a misidentification by the ion chromatography software. Accordingly, the laboratory calculated nitrate as N results manually, with this low-end calibration point omitted. This resulted in the increased nitrate as N reporting limit of 0.5 mg/L, as verified by the data sheets. These calculations are included in the raw data section of the data package. The quality and usability of the data was not affected, as the QAPP specifies a maximum reporting limit of 1.0 mg/L for nitrate as N.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the original nitrate as N analyses were accomplished within the prescribed analytical holding time of 48 hours. However, due to a malfunction of the instrument that resulted in the introduction of air into the system, the associated continuing calibration verification analyses exhibited elevated recoveries indicating a potential high bias in the analytical results. The original results could not be used. The reanalyses were conducted 1 day beyond the holding time. In addition, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N, BOD, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 22 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, iron, mercury, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-4-T01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on samples RR-4-T01N-SFW, pH class C, and was applicable for 2 out of 24 analytes. In calculating the charge balances, it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit for sample RR-1-T01N-SFW, which is summarized in Table 1.3.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	There were no field quality control blanks or duplicate sample. The field quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	BOD (mg/L)	Conductivity (umhos/cm)	pH
RR-4-T01N-SFW	1.0 UJ	0.005 UJ	0.01 UJ	1.5 UJ	210 J	8.1 J
RR-5-T01N-SFW	1.0 UJ	0.005 UJ	0.01 UJ	1.5 UJ	217 J	7.8 J
CABD4-T01N-SFW	1.0 UJ	0.005 UJ	0.01 UJ	1.5 UJ	151 J	7.8 J
RRS-27-TS01N-SFW	1.0 UJ	0.005 UJ	0.01 UJ	1.5 UJ	229 J	7.4 J
RR-18A-T01N-SFW	1.0 UJ	0.005 UJ	0.01 UJ	1.5 UJ	309 J	7.8 J
RR-18B-T01N-SFW	1.0 UJ	0.005 UJ	0.01 UJ	1.5 UJ	314 J	7.8 J
RR-1-T01N-SFW	1.0 UJ	0.005 UJ	0.01 UJ	1.5 UJ	168 J	8.2 J
ZWERGEL-T01N-SFW	1.0 UJ	---	---	1.5 UJ	164 J	8.2 J
RRS-23-T01N-SFW	1.0 UJ	0.005 UJ	0.01 UJ	1.5 UJ	169 J	7.2 J
RRS-23-T01N-SFW	1.0 UJ	0.005 UJ	0.01 UJ	1.5 UJ	220 J	7.4 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (metals) RL (chloride)	Samples Qualified	Qualification Codes
Chloride DF=1					0.2	0.4	CABD4-T01N-SFW	U MB-I
Aluminum (P) DF=1	34.0	27.0		33.2		23.4	RR-4-D01N-SFW, RR-5-D01N-SFW, CABD4-T01N-SFW, RRS-27-T01N-SFW, RRS-27-D01N-SFW, RR-1-T01N-SFW, RR-1-D01N-SFW, ZWERGEL-T01N-SFW, ZWERGEL-D01N-SFW, RRS-20-T01N-SFW, RRS-20-D01N-SFW, RRS-23-T01N-SFW, RRS-23-D01N-SFW	UJ MB-L UJ CCB, MB-L
Iron (P) DF=1				35.2		33.3	RRS-23-T01N-SFW, RRS-23-D01N-SFW	U CCB-I
Mercury (CV) DF=1	0.2			0.1	0.15	0.1	RR-4-T01N-SFW, RR-4-D01N-SFW, RR-5-T01N-SFW, RR-5-D01N-SFW, CABD4-T01N-SFW, CABD4-D01N-SFW, ZWERGEL-D01N-SFW, RRS-20-T01N-SFW, RRS-23-T01N-SFW, RRS-23-D01N-SFW RRS-27-T01N-SFW, RRS-27-D01N-SFW, RR-18A-T01N-SFW, RR-18A-D01N-SFW, RR-18B-T01N-SFW, RR-18B-D01N-SFW, RR-1-T01N-SFW, RR-1-D01N-SFW, ZWERGEL-T01N-SFW	U CCB, MB-I U MB-I
Zinc (P) DF=10					5.8	1.0	RR-4-D01N-SFW, RR-5-T01N-SFW, RR-5-D01N-SFW, CABD4-T01N-SFW, CABD4-D01N-SFW, RRS-27-T01N-SFW, RRS-27-D01N-SFW, RR-1-T01N-SFW, RR-1-D01N-SFW, ZWERGEL-T01N-SFW, ZWERGEL-D01N-SFW, RRS-20-T01N-SFW, RRS-20-D01N-SFW, RRS-23-T01N-SFW, RRS-23-D01N-SFW	U MB-I

P=ICP CV=Cold Vapor MB=method Blank Cob-Continuing Calibration Blank

IDL=Instrument Detection Limit RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total Dissolved Solids Summary

Sample	TDS Measured	TDS Calculated	TDS Ratio Calculated/ Measured	Evaluation Criteria	Qualification Code
RR-1-T01N-SFW	74	146	1.97	The criteria is met when the ratio between calculated verses measured is greater than 0.5 and less than 1.5.	J TvP-L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT139S

Sampling Event: July 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 10/10/03

Peer Reviewer: Stacey Coker

Date Completed: 11/02/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses		
					BOD/COD	Metals	Inorganic
RR-6-T01N-SFW	SA	534567		W	X	X	X
RR-6-D01N-SFW	SA	534568		W		X	
RRS-12-T01N-SFW	SA	534569		W	X	X	X
RRS-12-D01N-SFW	SA	534570		W		X	
RB03T-SFW	RB	534571		W	X	X	X
RR-3-T01N-SFW[3]	SA	534572		W		X	
RR-3-D01N-SFW[3]	SA	534573		W	X	X	X
RR-6V-T01N-SFW	SA	534574		W		X	
RR-6V-D01N-SFW	SA	534575		W	X	X	X
RRS-9-T01N-SFW	SA	534576		W		X	
RRS-9-D01N-SFW	SA	534577		W	X	X	X
RRS-15-T01N-SFW	SA	534578		W		X	
RRS-15-D01N-SFW	SA	534579		W	X	X	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

2 Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

3 Additional volume submitted for matrix QC.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted that the 0.2 mg/L calibration point for nitrate as N could not be included in the calibration, due to a misidentification by the ion chromatography software. Accordingly,

the laboratory calculated nitrate as N results manually, with this low-end calibration point omitted. This resulted in the increased nitrate as N reporting limit of 0.5 mg/L, as verified by the data sheets. These calculations are included in the raw data section of the data package. The quality and usability of the data was not affected, as the QAPP specifies a maximum reporting limit of 1.0 mg/L for nitrate as N.

The case narrative noted that the duplicate analyses of ammonia and phosphorus for sample RR-3-T01N-SFW yielded high relative percent differences (RPDs), 27% and 200%, respectively. The laboratory control limit for these compounds is ± 20%. However, in both cases sample results were less than 5X the RL and the absolute differences between the duplicate results were less than 1X the RL, therefore no qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the original nitrate as N analyses were accomplished within the prescribed analytical holding time of 48 hours. However, due to a malfunction of the instrument that resulted in the introduction of air into the system, the associated continuing calibration verification analyses exhibited elevated recoveries indicating a potential high bias in the analytical results. The original results could not be used. The reanalyses were conducted 1 day beyond the holding time. In addition, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N, BOD, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 22 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Chromium, iron, manganese, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS RR-3-T01N-SFW RR-3-D01N-SFW • LD RR-3-T01N-SFW RR-3-D01N-SFW	No	Matrix spike analyses were conducted on samples RR-3-T01N-SFW and RR-3-D01N-SFW. Three matrix spike results were outside acceptance limits. Table 1.3 summarize these results and the data qualification issued.
Method QC • Surrogates • Serial Dilution RR-3-T01N-SFW RR-3-D01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on samples RR-3-T01N-SFW and RR-3-D01N-SFW, pH class C, and both were applicable for 16 out of 24 analytes. For sample RR-3-D01N-SFW, the percent difference between the original result and result for the diluted sample for copper, lead, and nickel did not satisfy the ≤10% criterion and the results for this sample were qualified as estimated. Table 1.4 summarizes these results. The serial dilution results for each sampling event will be evaluated collectively and any resultant/additional data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. For sample RB03T/D-SFW, the anion/cation balance percent difference was –63.29, outside the acceptance range of ±13%. However, the contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary based on the ion balance calculation.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB03T-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There was one detection in the field quality control blanks (RB). It is summarized in Table 1.5. The RB results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	BOD (mg/L)	Conductivity (umhos/cm)	pH
RR-6-T01N-SFW	1.0 UJ	0.005 UJ	0.021 J	1.4 UJ	239 J	7.9 J
RRS-12-T01N-SFW	1.0 UJ	---	---	1.4 UJ	183 J	7.6 J
RB03T-SFW	1.0 UJ	0.005 UJ	0.01 UJ	1.4 UJ	0.00 J	7.4 J
RR-3-T01N-SFW	1.0 UJ	0.005 UJ	0.01 UJ	1.4 UJ	201 J	7.0 J
RR-6V-T01N-SFW	1.0 UJ	0.005 UJ	0.037 J	1.4 UJ	228 J	7.7 J
RRS-9-T01N-SFW	1.0 UJ	---	---	3.1 J	131 J	7.6 J
RRS-15-T01N-SFW	1.0 UJ	---	---	2.2 J	122 J	7.9 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (metals) RL (chloride)	Samples Qualified	Qualification Codes
Chloride DF=1					0.2	0.4	RRS-12-T01N-SFW, RB03T-SFW, RRS-9-T01N-SFW, RRS-15-T01N-SFW	U MB-I
Chromium (P) DF=1	-3.5	-3.6	-3.8	-4.0	-2.9	1.4	All samples in this package.	UJ CCB, MB-L
Iron (P) DF=1	-77.2	-60.8	-58.0	-42.0	-39.2	33.3	RR-6-T01N-SFW, RR-6V-T01N-SFW RR-6-D01N-SFW, RRS-12-T01N-SFW, RRS-12-D01N-SFW, RB03T-SFW, RR-3-T01N-SFW, RR-3-D01N-SFW, RR-6V-D01N-SFW, RRS-9-T01N-SFW, RRS-9-D01N-SFW, RRS-15-T01N-SFW, RRS-15-D01N-SFW	UJ/J CCB-L UJ/J CCB,MB-L
Manganese (P) DF=1	-1.3	-1.3	-1.3	-1.4	-1.1	0.7	RR-12-D01N-SFW, RRS-9-D01N-SFW RB03T-SFW, RRS-15-T01N-SFW, RRS-15-D01N-SFW	UJ/J CCB-L UJ/J CCB, MB-L
Zinc (P) DF=10	-3.1	-2.9	-2.8	-2.8		1.0	RB03T-SFW, RR-6V-D01N-SFW, RRS-9-T01N-SFW, RRS-9-D01N-SFW, RRS-15-T01N-SFW, RRS-15-D01N-SFW	J CCB-L

P=ICP MB=method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
RR-3-T01N-SFW					
Fluoride (mg/L)	27.5	NA	75-125%	NONE	J MS-L parent
Silver (µg/l)	36.0	79.6		NONE	J MS-L parent
RR-3-D01N-SFW					
Silver (µg/l)	33.9	81.4	75-125%	NONE	J MS-L parent

NA = Not appropriate

Table 1.4
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Evaluation Criteria	Action
RR-3-T01N-SFW			
Copper (µg/l)	25.7	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D<10%	Qualify parent sample J DL-L
Lead (µg/l)	213.3		Qualify parent sample J DL-L
Nickel (µg/l)	30.0		Qualify parent sample J DL-L

Table 1.5
Positive Results for Rinsate Blanks

Analyte	RB03T-SFW
Zinc (µg/l)	4.7

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT141A Sampling Event: Summer 2003 Surface Water

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 10/16/03

Peer Reviewer: Stacey Coker Date Completed: 10/20/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganic
HANSEN CREEK-T01N-SFW	SA	534736		W	X	X
HANSEN CREEK-D01N-SFW	SA	534737		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

2 Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Although the original nitrate analysis was conducted within the holding time, the result was considered unusable due to an instrument malfunction. The nitrate reanalysis was conducted 3 days beyond the 48-hour holding time. The analysis for pH and conductivity were exceeded by 2 and 22 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Laboratory Blank Results	No	Chromium, mercury, and nickel were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC 1. MS/MSD/PDS 2. LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the Summer 2003 Surface Water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC 1. Surrogates 2. Serial Dilution HANSEN CRREK-T01N-SFW 1. Internal Standards 2. Total vs. Partial Analyses 3. Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample HANSEN CREEK-T01N-SFW, pH class A, and was applicable for 2 out of 24 analytes. All %D for applicable analytes were within the acceptance range of <10%. The serial dilution results for the Summer 2003 Surface Water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Field QC 1. Field Duplicate (FD) 2. Rinsate Blank (RB) 3. Field Blank (FB) 4. Trip Blank (TB) 5. Other (e.g., splits)	NA	There were no field quality control blanks or samples in the sample delivery package. The field quality control results for the Summer 2003 Surface Water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Conductivity (umhos/cm)	pH
HANSEN CREEK-T01N-GRW	0.40 UJ	301 J	3.5 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Chromium (P) DF=100	-2.1	-2.1		-1.8	0.6	HANSEN CREEK-T01N-GRW, HANSEN CREEK-D01N-GRW	UJ CCB, MB-L
Mercury (CV) DF=1			-0.1		0.1	HANSEN CREEK-T01N-GRW, HANSEN CREEK-D01N-GRW	UJ/J CCB-L
Nickel (P) DF=100				-2.6	2.0	HANSEN CREEK-T01N-GRW, HANSEN CREEK-D01N-GRW	J MB-L

P=ICP CV=Cold Vapor MB=method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.4
Positive Results for Rinsate Blanks

Analyte	RB09T-GRW	RB02T-GRW
Total Dissolved Solids (mg/L)	1390	24
Bicarbonate Alkalinity (mg/L)	3.0	2.9
Total Alkalinity (mg/L)	3.0	2.9
Total Organic Carbon (mg/L)	1.0	---
Cadmium (µg/l)	0.33	---
Calcium (µg/l)	---	2510
Chromium (µg/l)	0.75	---
Manganese (µg/l)	---	17.8
Molybdenum (µg/l)	3.6	9.6

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT142S

Sampling Event: Summer 2003 SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 11/11/03

Peer Reviewer: Stacey Coker

Date Completed: 11/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Matrix	Analyses	
			Metals	Inorganics
ERLMID-T01N-SFW	534738	W	X	X
ERLMID-D01N-SFW	534739	W	X	
ERLIN-T01N-SFW	534740	W	X	X
ERLIN-D01N-SFW	534741	W	X	
UFLOUT-T01N-SFW	534742	W	X	X
UFLOUT-D01N-SFW	534743	W	X	
UFLMID-T01N-SFW	534744	W	X	X
UFLMID-D01N-SFW	534745	W	X	
UFLIN-T01N-SFW	534746	W	X	X
UFLIN-D01N-SFW	534747	W	X	
ERLOUT-T01N-SFW	534748	W	X	X
ERLOUT-D01N-SFW	534749	W	X	

Matrix: W = Water RB = Rinsate Blank

QC Type: SA = Sample

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the laboratory case narrative are summarized in the appropriate sections in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for samples ERLMID-T01N-SFW, ERLIN-T01N-SFW, and UFLMID-T01N-SFW were accomplished three days beyond the prescribed analytical holding time of 48 hours due to a backlog of samples caused by a series of instrument malfunctions. In addition, the nitrate analyses for the remaining samples were accomplished 19 days beyond the holding time due to a sample management error at the laboratory. It is not apparent from the summary or extended data package, the nature of this issue. Nondetect nitrate results were not rejected due to the stability of nitrate. Accordingly, all nitrate results for all samples were qualified as estimated (J/UJ). The 48-hour holding times for the majority of nitrite, orthophosphate, and BOD_5 samples were exceeded by several hours. Accordingly, analyses run outside of the holding time were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 23 days beyond log-in. The pH for all samples was measured approximately three hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD UFLMID-T01N-SFWMS UFLMID-D01N-SFWMS • PDS • LD UFLMID-T01N-SFWREP UFLMID-D01N-SFWREP		Ammonia in the form of nitrogen and sulfate were recovered below the acceptance range of 75-125% in the matrix spike analysis of sample UFLMID-T01N-SFW, suggesting a potential low bias in the reporting of ammonia and sulfate results. In the matrix spike analysis of sample UFLMID-T01N-SFW, selenium was recovered at 74.8%. Due to the fact that this percent recovery rounds to the lower limit of the acceptance range, no qualification was considered necessary. Table 1.3 summarizes these analytes along with the associated percent recoveries and the qualification codes assigned to the parent samples. The matrix quality control results for the Summer 2003 Surface Water sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. The result for iron in sample UFLMID-T01N-SFW was qualified as estimated (J) on the basis of laboratory duplicate imbalance. Iron was measured in the original sample at 378.2 µg/L, and in the duplicate at 484.5 µg/L. As both concentrations were less than 5x the CRDL (run at a straight analysis), the absolute difference was compared to the CRDL. Because the absolute difference (106.3 µg/L) was greater than 1x the CRDL (100 µg/L), the parent sample result was qualified.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (C) UFLMID-T01N-SFW UFLMID-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	No	Two serial dilution tests were conducted on matrix spike samples UFLMID-T01N-SFW and UFLMID-D01N-SFW. The serial dilution results could not be used to assess potential interferences for 3 of the 24 metals analyzed by ICP since 20 analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. Table 1.4 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. Several results for analytes were qualified as estimated (J) on the basis of total versus partial disagreement. Table 1.5 summarizes the results qualified along with the concentrations reported.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No field QC samples were analyzed with this data package. The field QC results for the Summer 2003 Surface Water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH	BOD_5
ERLMID-T01N-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	2570 J	6.7 J	1.6 UJ
ERLIN-T01N-SFW	0.40 UJ	0.0050 UJ	0.52 J	305 J	7.6 J	1.6 UJ
UFLOUT-T01N-SFW	0.43 J	---	---	306 J	8.1 J	---
UFLMID-T01N-SFW	0.57 J	---	---	215 J	8.2 J	---
UFLIN-T01N-SFW	0.46 J	0.0074 J	0.036 J	213 J	8.2 J	---
ERLOUT-T01N-SFW	0.31 J	0.0050 UJ	0.010 UJ	211 J	7.8 J	1.6 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (MS)	---	---	---	---	0.6	---	0.5	UFLIN-T01N-SFW UFLMID-D01N-SFW	U CCB-I
Beryllium (P)	---	---	0.3	0.4	---	---	0.2	ERLOUT-D01N-SFW ERLOUT-T01N-SFW UFLIN-D01N-SFW	U CCB-I
Copper (P)	---	---	---	---	---	2.073	1.4	ERLIN-D01N-SFW ERLMID-D01N-SFW ERLMID-T01N-SFW ERLOUT-D01N-SFW ERLOUT-T01N-SFW UFLIN-D01N-SFW UFLIN-T01N-SFW UFLMID-D01N-SFW UFLOUT-D01N-SFW UFLOUT-T01N-SFW	U MB-I
Mercury (CV)	0.1	0.2	0.1	---	(CCB6) -0.1	---	0.1	ERLOUT-D01N-SFW ERLOUT-T01N-SFW UFLIN-D01N-SFW	J CCB-L
Zinc (P)	---	---	---	---	---	9.319	5.7	UFLIN-D01N-SFW UFLIN-T01N-SFW UFLMID-D01N-SFW UFLMID-T01N-SFW UFLOUT-D01N-SFW UFLOUT-T01N-SFW	U MB-I

MS=ICP-MS P=ICP CV=Cold Vapor CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Qualification Codes
UFLMID-T01N-SFW				
Ammonia-nitrogen	72.5	NA	75-125%	UJ MS-L parent
Sulfate	72.6	NA		J MS-L parent
Selenium	74.8	76.8		NQ[1]

NA = Not appropriate PDS = Post Digestion Spike

NQ = No Qualification

[1]Matrix spike recovery rounds to 75% and PDS within limits

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification
UFLMID-T01N-SFW		
Arsenic	13.3	UJ DL-L parent
Cadmium	13.3	UJ DL-L parent

Table 1.5
Total vs. Partial Qualifications

Sample	Analyte	Total (mg/L)	Ortho (mg/L)	RL (mg/L)	Evaluation Criterion	Qualification Code
ERLIN-T01N-SFW	Phosphorus vs Orthophosphate	0.012	0.52	0.010	AD > 2xRL	J TvP-I
UFLOUT-T01N-SFW		0.056	0.30			

Evaluation Criteria:

%D ≤ 30% if both results are > 5x RL

AD ≤ 2x RL if either result is < 5x RL

RL = Instrument Detection Limit (IDL) x Dilution Factor (DF)

%D = percent difference (calculated as (dissolved-total/dissolved x100%)

AD = Absolute Difference

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT143S

Sampling Event: Summer 2003 SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 09/25/03

Peer Reviewer: Stacey Coker

Date Completed: 11/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
UPPERCABRESTO-T01N-SFW	SA	534822	UPPERCABRESTO-T01NS UPPERCABRESTO-T01NSFW	W	X	X	X	X
UPPERCABRESTO-D01N-SFW	SA	534823	UPPERCABRESTO-D01N UPPERCABRESTO-D01NSFW	W	X			
RRS-13-T01N-SFW	SA	534824		W	X	X	X	X
RRS-13-D01N-SFW	SA	534825		W	X			

Matrix: W = Water RB = Rinsate Blank

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the laboratory case narrative.

In the metals analysis of the laboratory control sample (LCS), the recovery of silver was 70.7%, slightly outside the acceptance range of 75-125%, suggesting the possibility of a low bias in the reporting of the associated silver results. Although the silver recovery for the duplicate LCS sample was 81.1%, the associated silver results were qualified as estimated (J/UJ, LCS-L) to address the potential low bias suggested by the LCS results (average recovery = 72.9%).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	According to the laboratory log-in sheet, one of the coolers was not received with the original shipment due to a Fed-ex error which caused the cooler to be held up over a weekend. This cooler was received four days after shipping, outside of the required temperature range of 2-6°C, with a temperature of 9°c. The samples in this cooler were logged in at the direction of the client (URS), as the temperature excursion was outside of the control of URS, the number of affected samples was minimal (2), and the magnitude of the temperature exceedance was not considered to adversely affect the quality of usability given the stability of the parameters of interest. However, as a conservative measure, those inorganic parameters, thought to possibly be more affected by this were qualified as estimated (J/UJ P-I), as summarized in Table 1.1.
Holding Times	No	As mentioned in the laboratory case narrative, the samples in this delivery group were received outside the prescribed analytical holding time of 48 hours for the nitrite, BOD_5, orthophosphate, and nitrate analyses, due to a FedEx delay. These parameters were analyzed in excess of 2x the holding time. Due to the stability of these analytes, all results were qualifies as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 26 days beyond log-in. The pH for all samples was measured approximately eight hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.2 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.3 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD		The matrix quality control results for the Summer 2003 Surface Water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) UPPERCABRESTO-T01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	No	One serial dilution analysis was conducted on sample UPPERCABRESTO-T01N-SFW. The serial dilution results could not be used to assess potential interferences for 23 of the 24 metal analytes, as only one analyte (calcium) reported an initial concentration in excess of 50 times the IDL run at a straight dilution. The %D (difference between the initial and 5-fold dilution result) for calcium was reviewed for a percentage in excess of ±10%. No data qualification was necessary on the basis of serial dilution. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. No qualification of data was necessary on the basis of cation/anion imbalance. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5. As noted in the laboratory case narrative, the TDS ratio for sample RRS-13-T/D01N-SFW was low (0.57), indicating an elevated measured TDS. The laboratory suspected that this may have been due to the fact that the TDS analysis was preformed 43 days beyond the holding time of 7 days.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No field QC samples were analyzed with this data package. The field QC results for the Summer 2003 Surface Water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Preservation Qualifications

Parameters	UPPERCABRESTO-T01N-SFW	RR-13-T01N-SFW
Nitrate – N	0.40 UJ	0.40 UJ
Hydroxide Alkalinity	1.0 UJ	1.0 UJ
Carbonate Alkalinity	1.0 UJ	1.0 UJ
Bicarbonate Alkalinity	46.2 J	45.0 J
Total Alkalinity	46.2 J	45.0 J
Ammonia-Nitrogen	0.040 UJ	0.040 UJ
Total Kjeldahl Nitrogen	0.24 UJ	0.24 UJ
Nitrite Nitrogen	0.0050 UJ	0.0050 UJ
Orthophosphate-P	0.010 UJ	0.010 UJ
BOD_5	1.5 UJ	1.5 UJ
COD	20.0 UJ	20.0 UJ

Table 1.2
Holding Time Qualifications for Inorganics

Sample	Nitrate (N) (mg/L)	Nitrite (mg/L)	Ortho-P (mg/L)	Cond. µmhos/cm	pH (std units)	BOD_5 (mg/L)	TDS (mg/L)
UPPERCABRESTO-T01N-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	125 J	7.7 J	1.5 UJ	---
RRS-13-T01N-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	113 J	7.6 J	1.5 UJ	174 J

Table 1.3
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Chromium (P)	-6.1	-5.7	-5.5	-5.9	-5.995	1.4	All samples	UJ MB, CCB-L J MB, CCB-L
Manganese (P)	-1.4	-1.3	-1.3	-1.4	-1.399	0.7		
Nickel (P)	-17.6	-18.2	-17.7	-17.9	-18.980	2.1		
Lead (MS)	---	---	---	---	0.141	0.1	UPPERCABRESTO-T01N-SFW	U MB-I

MS=ICP-MS P=ICP CV=Cold Vapor CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT150S

Sampling Event: July 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

L.P. Reviewer: Ansley Watson

Date Completed: 02/18/04

Data Reviewer: Karen Kronoveter

Date Completed: 09/30/03

Peer Reviewer: Stacey Coker

Date Completed: 02/01/04 (SS), 02/22/04 (LPR)

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
RR-DS-SPRING13-T01N-SFW	SA	535483	RR-DS-SPRING13T01NSF RR-DS-SPRING39T01NSFW	W	X	X	X	X
RR-DS-SPRING13-D01N-SFW	SA	535484	RR-US-SPRING13D01NSFW	W	X			
RR-US-SPRING13-T01N-SFW	SA	535485	RR-US-SPRING13T01NSF RR-US-SPRING13T01NSFW	W	X	X	X	X
RR-US-SPRING13-D01N-SFW	SA	535486	RR-US-SPRING13D01NSFW	W	X			
RR-DS-SPRING39-T01N-SFW	SA	535487	RR-DS-SPRING39T01NSF	W	X	X	X	X
RR-DS-SPRING39-D01N-SFW	SA	535488		W	X			
RR-US-SPRING39-T01N-SFW	SA	535489	RR-US-SPRING39T01NSF RR-US-SPRING39T01NSFW	W	X	X	X	X
RR-US-SPRING39-D01N-SFW	SA	535490		W	X			

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank FB = Field Blank TB = Trip Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The majority of nitrate, nitrite, orthophosphate, and BOD_5 analyses were performed several hours beyond the prescribed analytical holding time of 48 hours, and were accordingly qualified as estimated. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 22 days beyond log-in. The pH for all samples was measured approximately eight hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) RR-DS-SPRING13-T01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	No	One serial dilution test was conducted on sample RR-DS-SPRING13-T01N-SFW. The serial dilution results could not be used to assess potential interferences for 20 of the 24 metals analyzed by ICP since only four analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. The percent difference for aluminum was 86.4%, thereby resulting in the qualification of this analyte as estimated (J), with a high bias direction assigned. The serial dilution results for the July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The calcium concentration of 79800 µg/L in the filtrate (dissolved) sample RR-US-SPRING39-D01N-SFW is greater than the calcium concentration of 44700 µg/L in the corresponding total metals sample, RR-US-SPRING39-T01N-SFW. Due to the fact that both values are greater than 5x the RL (5000 µg/L), the percentage of partial in excess of the total concentration was compared to an evaluation criteria of 30%. Accordingly, the calcium results for both samples were qualified as estimated (J TVP-I) with an indeterminate direction of bias. The magnesium and sodium results for samples RR-US-SPRING39-D01N-SFW and RR-US-SPRING39-T01N-SFW were qualified as estimated (J/UJ TVP-I) because the dissolved sample results were greater than the total results. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	Yes	No field QC samples were analyzed with this data package. The field QC results for the July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	No	The laboratory case narrative noted the nitrite analyses of the continuing calibration verifications (CCV1 and CCV2) associated with the samples in this delivery group yielded recoveries (CCV1 and CCV2=115%) in excess of the established control limits of 90-110%. The QAPP specifies the calibration should be repeated and the samples reanalyzed back until the last successful calibration. Upon review of the run logs, it was apparent that this protocol was not followed. However, due to the fact that all reported nitrite results were below the reporting limit, the suggested potential high bias in the reporting of nitrite results would not affect the reported sample results. Therefore qualification was not necessary.
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (N) (mg/L)	Nitrite (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)	BOD_5 (mg/L)
RR-DS-SPRING13-T01N-SFW	0.48 J	0.0050 UJ	0.010 UJ	324 J	7.6 J	1.5 UJ
RR-US-SPRING13-T01N-SFW	0.41 J	0.0050 UJ	0.010 UJ	319 J	7.8 J	1.5 UJ
RR-DS-SPRING39-T01N-SFW	0.44 J	0.0050 UJ	0.010 UJ	310 J	7.5 J	1.5 UJ
RR-US-SPRING39-T01N-SFW	0.73 J	---	0.010 UJ	570 J	6.9 J	1.5 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	-182.7	-170.5	-174.8	-187.2	18.3	All samples with the **exception** of: RR-DS-SPRING13-T01N-SFW	J MB, CCB-L
Beryllium (P)	---	---	0.3	---	0.2	RR-US-SPRING39-D01N-SFW	U CCB-I
Chromium (P)	---	0.6	0.7	-0.662	0.6	All samples	UJ MB,CCB-L UJ MB-I
Iron (P)	---	40.1	52.1	---	16.8	RR-DS-SPRING13-D01N-SFW RR-DS-SPRING39-D01N-SFW RR-US-SPRING39-D01N-SFW	U CCB-I
Lead (MS)	---	---	---	0.104	0.1	RR-DS-SPRING13-D01N-SFW	U MB-I
Potassium (MS)	---	332.4	---	---	250.0	RR-US-SPRING13-D01N-SFW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT151C

Sampling Event: July 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 09/22/03

Peer Reviewer: Larry Brook

Date Completed: 10/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MMW-28A-T01N-GRW	SA	535519		W	X	X
MMW-28A-D01N-GRW	SA	535520		W	X	
MMW-29A-T01N-GRW	SA	535521		W	X	X
MMW-29A-D01N-GRW	SA	535522		W	X	
RB09T-GRW	RB	535523		W	X	X
MMW-32B-T01N-GRW	SA	535647		W	X	X
MMW-32B-D01N-GRW	SA	535648		W	X	
STORM 1-T01N-SFW	SA	535649		W	X	X
STORM 1-D01N-SFW	SA	535650		W	X	
RB02T-GRW	RB	535747		W	X	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

2 Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted that the results for cyanide in sample RB02T-GRW were inadvertently not analyzed. The laboratory was unsuccessful in locating the sample, and therefore was unable to analyze the sample for cyanide. The client was contacted, and it was decided to report the RB02T-GRW sample in this case submittal without the results from cyanide.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample MMW-28A (pH=6.2) was logged in as a class "B" pH sample due to measurements taken at the laboratory. The sample STORM1-T01N/D01N-SFW was inadvertently written on the COC as STORM1-T01N/D01N-GRW. The client was contacted and the correction was made to reflect the proper field ID.
Holding Times	No	The following holding time issues were noted in the laboratory case narrative: An accidental internal laboratory miscommunication regarding sample RB02T-GRW, caused the 7-day holding time for total suspended solids (TSS) and total dissolved solids (TDS) to be exceeded by 1-2 days, respectively. Also, the 14-day holding time was exceeded by 4 days for hydroxide, carbonate, bicarbonate , and total alkalinity. The nitrate as N were accomplished 1 day beyond the 48-hour holding time due to a malfunction in the instrument that created a backlog in all of the samples. Also, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N, Nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 1-2 and 15-16 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, beryllium, cadmium, copper, iron, molybdenum, and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-28A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample MMW-28A-T01N-GRW, pH class C, and was applicable for 1 out of 24 analytes. Recovery for internal standards Li and Y were high for the ICPMS analysis of samples MMW-29A-T01N-GRW, MMW-29A-D01N-GRW, and RB02T-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using these standards. For sample MMW-28A-T01N/D01N-GRW the analysis of orthophosphate exceeded that of the total analysis of phosphorus beyond variation expected due to the accuracy limitations of the method. Table 1.3 summarizes these results and the data qualification.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB02T-GRW RB09T-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were a few various detections in the field quality control blanks (RB). Table 1.4 summarizes these detections. The field quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Ortho-phosphate (mg/L)	Hydro. Alkalinity (mg/L)	Carb. Alkalinity (mg/L)	Bicarb. Alkalinity (mg/L)	Total Alkalinity (mg/L)	TDS (mg/L)	TSS (mg/L)	Conductivity (umhos/cm)	pH
MMW-28A-T01N-GRW	0.62 J	0.005 UJ	0.12 J	---	---	---	---	---	---	871 J	6.2 J
MMW-29A-T01N-GRW	3.3 J	0.005 UJ	0.018 J	---	---	---	---	---	---	1440 J	5.0 J
RB09T-GRW	0.4 UJ	0.005 UJ	0.01 UJ	---	---	---	---	---	---	0.41 J	5.5 J
MMW-32B-T01N-GRW	0.4 UJ	0.005 UJ	0.045 J	---	---	---	---	---	---	2740 J	6.8 J
STORM1-T01N-SFW	---	---	---	---	---	---	---	---	---	675 J	7.0 J
RB03T-GRW	---	0.005 UJ	0.01 UJ	1.0 UJ	1.0 UJ	2.9 J	2.9 J	24 .0 J	0.5 UJ	0.01 J	7.4 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples qualified	Qualification code
Aluminum (P) DF=10				49.1	-38.7	18.3	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, RB09T-GRW, MMW-32B-T01N-GRW, MMW-32B-D01N-GRW, STORM1-D01N-SFW, RB02T-GRW STORM1-T01N-SFW	UJ/J MB-L UJ MB, CCB-L
Antimony (MS) DF=2					-1.0	0.5	All samples in this package.	UJ MB-L
Beryllium (P) DF=1	0.2	0.4	0.4		0.3	0.2	MMW-28A-T01N-GRW	U MB-I
Cadmium (P) DF=1	0.8	0.7	0.4		0.4	0.3	MMW-28A-T01N-GRW MMW-28A-D01N-GRW, RB09T-GRW, MMW-32B-T01N-GRW, MMW-32B-D01N-GRW	U CCB-I U CCB, MB-I
Iron (P) DF=10			18.0	29.6		16.8	STORM1-T01N-SFW	U CCB-I
Molybdenum (P) DF=1	2.2	2.3		1.7		1.6	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, RB09T-GRW, MMW-32B-T01N-GRW, MMW-32B-D01N-GRW, RB02T-GRW	U CCB-I
Sodium (P) DF=10		-273.8		-378.1		218.8	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-29A-D01N-GRW, RB09T-GRW, RB02T-GRW	UJ/J CCB-L

MS=ICP-MS P=ICP MB=method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit RL= Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Absolute Difference (mg/L)	RL (mg/L)	Evaluation Criteria	Action
MMW-28A-T01N-GRW				
Orthophosphate vs. Phosphorus	0.11	0.01	Evaluation criteria is met when the absolute difference is less than 2x RL	J/UJ TvP-I for sample MMW-28A-T01N-GRW.

Table 1.4
Positive Results for Rinsate Blanks

Analyte	RB09T-GRW	RB02T-GRW
Total Dissolved Solids (mg/L)	1390	24
Bicarbonate Alkalinity (mg/L)	3.0	2.9
Total Alkalinity (mg/L)	3.0	2.9
Total Organic Carbon (mg/L)	1.0	---
Cadmium (µg/l)	0.33	---
Calcium (µg/l)	---	2510
Chromium (µg/l)	0.75	---
Manganese (µg/l)	---	17.8
Molybdenum (µg/l)	3.6	9.6

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE FALL 2003 SURFACE WATER SAMPLING EVENT DATA

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004

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140286

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Narratives 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Dilution Schemes/Non-Detects With Elevated Rls 3-1
3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses: 3-1
3.2.3 Non-Valid Matrix Spikes 3-2
3.2.4 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Summary/Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-3
4.3 Serial Dilution Results 4-4

Section 5 Collective Summary/Assessment of Field QC Results 5-1

5.1 Field Duplicate Results 5-1
5.2 Rinsate Blank Results 5-2
5.3 Field Blank Results 5-3

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-1
6.4 Representativeness 6-2
6.5 Comparability 6-2
6.6 Sensitivity 6-2

List of Attachments

Attachment 1.1 Data Review Summary for Data Package WAT178S

Attachment 1.2 Data Review Summary for Data Package WAT179S

Attachment 1.3 Data Review Summary for Data Package WAT180S

Attachment 1.4 Data Review Summary for Data Package WAT181S

Attachment 1.5 Data Review Summary for Data Package WAT182S

TABLE OF CONTENTS

Attachment 1.6 Data Review Summary for Data Package WAT183S
Attachment 1.7 Data Review Summary for Data Package WAT184S
Attachment 1.8 Data Review Summary for Data Package WAT185S

This report contains the results of the data validation conducted for 55 surface water samples and associated quality control (QC) samples collected during the Fall 2003 Surface Water sampling event as part of the Molycorp RI/FS.

The surface water samples were sent to STL Burlington (STL-B), in Colchester, Vermont for analysis, STL-B sub-contracted the metals analyses to STL North Canton, in North Canton, Ohio in order to meet the turn-around time requirements. The results were reported in eight data packages (WAT178 thru WAT185). All samples were analyzed for total metals, dissolved metals and inorganic parameters (aqueous media) as defined in the RI/FS QAPP. This data validation report describes the data validation process used and presents the data review results for the surface water and associated QC samples submitted to STL for chemical analysis. The field sample IDs and associated data package numbers are provided in table below.

Data Package	Field ID Recorded on COC	QC Designation
WAT178S	RD-1-T01N-SFW	MS,LD for metals only
	RD-1-D01N-SFW	
	LR-13-T01N-SFW	
	LR-13-D01N-SFW	
	SD-1-T01N-SFW	
	SD-1-D01N-SFW	
	ND-1-T01N-SFW	
	ND-1-D01N-SFW	
	CD-1-T01N-SFW	
	CD-1-D01N-SFW	
	LR-16-T01N-SFW	
	LR-16-D01N-SFW	
WAT179S	CABD4-T01N-SFW	MS,LD for metals only
	CABD4-D01N-SFW	
	LR-8A-T01N-SFW	
	LR-8A-D01N-SFW	
	LR-8A-T01D-SFW	FD to LR-8A-T01N-SFW
	LR-8A-D01D-SFW	FD to LR-8A-D01N-SFW
	LR-5-T01N-SFW	
	LR-5-D01N-SFW	
	RR-20-T01N-SFW	
	RR-20-D01N-SFW	
	RR-18B-T01N-SFW	
	RR-18B-D01N-SFW	SD
WAT180S	RR-17-T01N-SFW	SD,MS,LD for metals only
	RR-17-D01N-SFW	
	RR-18A-T01N-SFW	
	RR-18A-D01N-SFW	
	RR-16-T01N-SFW	
	RR-16-D01N-SFW	
	RR-11A-T01N-SFW	
	RR-11A-D01N-SFW	

Data Package	Field ID Recorded on COC	QC Designation
WAT181S	RR-11C-T01N-SFW	
	RR-11C-D01N-SFW	
	RR-11C-T01D-SFW	FD to RR-11C-T01N-SFW
	RR-11C-D01D-SFW	FD to RR-11C-D01N-SFW
	RR-12-T01N-SFW	
	RR-12-D01N-SFW	
	LR-1-T01N-SFW	
	LR-1-D01N-SFW	
	RR-15-T01N-SFW	MS,LD for metals and inorganic parameters. PDS on cyanide only.
	RR-15-D01N-SFW	MS,LD for metals only
	RR-6V-T01N-SFW	
	RR-6V-D01N-SFW	
	RR-6A-T01N-SFW	
	RR-6A-D01N-SFW	
	RR-6-T01N-SFW	
	RR-6-D01N-SFW	
	RR-7-T01N-SFW	
	RR-7-D01N-SFW	SD
WAT182S	RR-13-T01N-SFW	SD
	RR-13-D01N-SFW	
	RR-5-T01N-SFW	MS,LD for metals and inorganic parameters. PDS on cyanide only.
	RR-5-D01N-SFW	MS,LD for metals only
	RR-8-T01N-SFW	
	RR-8-D01N-SFW	
	RR-11A1-T01N-SFW	
	RR-11A1-D01N-SFW	
	RR-11B-T01N-SFW	
	RR-11B-D01N-SFW	
	RR-8A-T01N-SFW	
	RR-8A-D01N-SFW	
	RR-10A1-T01N-SFW	
	RR-10A1-D01N-SFW	
	RR-10-T01N-SFW	MS,LD for metals and inorganic parameters. PDS on cyanide only.
	RR-10-D01N-SFW	MS,LD for metals only
	RR-14-T01N-SFW	
	RR-14-D01N-SFW	
WAT183S	RRS-18-T01N-SFW	SD,MS,LD for metals only
	RRS-18-D01N-SFW	
	RRS-15-T01N-SFW	
	RRS-15-D01N-SFW	
	UNIQUE3-T01N-SFW	
	UNIQUE3-D01N-SFW	
	UNIQUE4-T01N-SFW	
	UNIQUE4-D01N-SFW	
	RRS-20-T01N-SFW	

Data Package	Field ID Recorded on COC	QC Designation
WAT183S (Cont.)	RRS-20-D01N-SFW	
	ZWERGEL-T01N-SFW	
	ZWERGEL-D01N-SFW	
	UPPERCABRESTO-T01N-SFW	
	UPPERCABRESTO-D01N-SFW	
	RR-4-T01N-SFW	
	RR-4-D01N-SFW	
	UFLIN-T01N-SFW	
	UFLIN-D01N-SFW	
	UFLMID-T01N-SFW	
	UFLMID-D01N-SFW	SD
WAT184S	RR-1-T01N-SFW	SD,MS,LD for metals only
	RR-1-D01N-SFW	
	RR-13-T01N-SFW	
	RR-13-D01N-SFW	
	UNIQUE5-T01N-SFW	
	UNIQUE5-D01N-SFW	
	UNIQUE6-T01N-SFW	
	UNIQUE6-D01N-SFW	
	ERLMID-T01N-SFW	
	ERLMID-D01N-SFW	
	ERLOUT-T01N-SFW	
	ERLOUT-D01N-SFW	
	RRS-12-T01N-SFW	
	RRS-12-D01N-SFW	
	RRS-9-T01N-SFW	
	RRS-9-D01N-SFW	
	RRS-3-T01N-SFW	
	RRS-3-D01N-SFW	
	RRS-3-T01D-SFW	FD to RRS-3-T01N-SFW
	RRS-3-D01D-SFW	FD to RRS-3-D01N-SFW, SD
WAT185S	RRS-23-T01N-SFW	
	RRS-23-D01N-SFW	
	RRS-27-T01N-SFW	
	RRS-27-D01N-SFW	
	UFLOUT-T01N-SFW	
	UFLOUT-D01N-SFW	
	ERLIN-T01N-SFW	
	ERLIN-D01N-SFW	

FD = Field Duplicate MS = Matrix Spike
SD = Serial Dilution PDS = Post-Digestion Spike LD = Laboratory Duplicate

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate or spike duplicate analysis, post-digestion spike recoveries, ICP serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, rinsate blanks, field blanks, and trip blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1 and is as follows: if no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used; if no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used; if no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

In all cases of professional judgement exercised in evaluating the need for qualification, the basis for the professional judgement used is provided in the data review narrative. Section 3.0 provides the data review narratives for each of the data packages.

The site-specific matrix spike/matrix spike duplicate (MS/MSD) results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of

that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (MS/MSD results, laboratory duplicate results, and serial dilution results) and associated sample qualification. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

3.1 DATA REVIEW NARRATIVES

The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries, which are included in Attachment 1. The data qualifiers, reason codes, and bias codes were marked on the data sheets, which are retained in the project files. The data validation qualifiers reason codes and bias codes are also stored in the electronic database.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several issues were identified which globally affected all relevant water samples analyzed for the Fall 2003 Surface Water event. Although these issues may have been addressed in the individual data review summary reports, it was considered necessary to summarize them this data validation report.

3.2.1 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

During the project, the need to analyze all surface water samples without dilution, regardless of pH, was identified. As such, surface water samples were generally analyzed without dilution, unless dilution was necessary based on analyte concentrations present in the sample.

3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses:

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgement, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the analyses. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not considered an appropriate measure for accessing accuracy of the analysis.

3.2.3 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.4 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 3.0. STL data package WAT178S was used to evaluate laboratory performance criteria. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. As a result of the LPR, the following parameters were evaluated for each package:

- Continuing Calibration Verification (CCV) results were reviewed in all metal results. No additional data qualification resulted, as all were either within the acceptance recovery range of 90-110% or were not applicable to any of the samples in the sequence run.
- Initial Calibration Verification (ICV) results were reviewed and no additional data qualification resulted.

The site-specific matrix spike (MS) results, laboratory duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analysis, LD analyses, and the serial dilution results for the samples collected during the sampling event.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

The table below illustrates the site-samples that were used to prepare matrix spike samples. As eight matrix spikes (three were planned, and the remaining five were extras) were prepared and analyzed for metals and three matrix spikes were prepared and analyzed for dissolved metals and inorganic parameters for 55 field sample sites (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
RD-1-T01N-SFW	Surface Water	WAT178S	Metals[1]
CABD4-T01N-SFW	Surface Water	WAT179S	Metals[1]
RR-17-T01N-SFW	Surface Water	WAT180S	Metals[1]
RR-15-T01N-SFW	Surface Water	WAT181S	Metals and Inorganic Parameters[2]
RR-15-D01N-SFW	Surface Water	WAT181S	Dissolved Metals[2]
RR-5-T01N-SFW	Surface Water	WAT182S	Metals and Inorganic Parameters[2]
RR-5-D01N-SFW	Surface Water	WAT182S	Dissolved Metals[2]
RR-10-T01N-SFW	Surface Water	WAT182S	Metals and Inorganic Parameters[2]
RR-10-D01N-SFW	Surface Water	WAT182S	Dissolved Metals[2]
RRS-18-T01N-SFW	Surface Water	WAT183S	Metals[1]
RR-1-T01N-SFW	Surface Water	WAT184S	Metals[1]

[1] Additional QC samples

[2] Planned QA samples; additional volume collected and QC analyses requested on COC.

A number of spike recoveries were outside of the QC acceptance limits of 75%-125%. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, and the magnitude of outages, and the number of valid spikes relative to the size of the sample set.

The table below summarizes the results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Analyte	Total				Dissolved				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Aluminum	8	0	0	95.9	3	0	0	95.0	None
Antimony	8	0	0	88.0	3	0	0	88.3	None
Arsenic	8	0	0	109.4	3	0	0	108.7	None
Barium	8	0	0	104.8	3	0	0	105.0	None

Analyte	Total				Dissolved				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Beryllium	8	0	0	106.3	3	0	0	108.3	None
Boron	8	0	0	100.6	3	0	0	100.7	None
Cadmium	8	0	0	106.9	3	0	0	106.0	None
Calcium	8	0	0	108.0	3	0	0	103.7	None
Chromium	8	0	0	106.4	3	0	0	105.0	None
Cobalt	8	0	0	105.3	3	0	0	103.7	None
Copper	8	0	0	91.9	3	0	0	90.7	None
Iron	8	0	0	115.6	3	0	0	114.7	None
Lead	8	0	0	95.1	3	0	0	94.3	None
Magnesium	8	0	0	104.5	3	0	0	102.3	None
Manganese	8	0	0	107.3	3	0	0	107.0	None
Mercury	8	0	1	110.1	3	0	0	109.3	No qualification of parent sample because slightly high MS recovery of 126% was calculated using a sample concentration for the non-detected analyte of 0 ug/L A MS recovery of 123% is calculated if the MDL value of 0.067 ug/L is used instead of zero.
Molybdenum	8	0	0	90.1	3	0	0	88.3	None
Potassium	8	0	0	107.6	3	0	0	105.7	None
Selenium	8	0	0	114.0	3	0	0	112.7	None
Nickel	8	0	0	93.6	3	0	0	93.7	None
Thallium	8	0	0	95.6	3	0	0	95.7	None
Sodium	8	0	0	103.8	3	0	0	102.0	None
Silver	8	0	0	100.5	3	0	0	99.7	None
Vanadium	8	0	0	97.0	3	0	0	98.0	None
Zinc	8	0	0	108.6	3	0	0	106.7	None
Cyanide	3	0	0	92.0	NA				None
Chloride	3	0	0	104.7					None
Nitrate	3	0	0	105.9					None
Total Alkalinity	3	0	0	118.0					None
Fluoride	3	0	0	104.7					None
Ammonia	3	0	0	95.4					None
TKN	3	0	0	92.2					None
Nitrite	3	0	0	110.8					None
Orthophosphate	3	0	1	108.7					J MS-H for parent sample only.
Phosphorous	3	0	0	99.3					None
Sulfate	3	3	0	67.3					J/UJ MS-L for all sulfate results.
BOD	3	0	0	101.3					None
COD	3	0	0	107.6					None
TOC	3	0	0	112.4					None

With the exceptions of sulfate, data qualification was limited to parent samples only. For sulfate, the general bias direction suggested by the matrix spike result is low. Although orthophosphate exhibited 1 of 3 valid spike results (33%) outside QC acceptance limits, data qualification was

limited to the parent sample because the exceeding recovery was marginal (127%) and the average recovery was within QC acceptance limits.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

The table below illustrates the site-samples that were used to prepare laboratory duplicate samples. As nine laboratory duplicates were prepared and analyzed (three were planned, and the remaining five were extras) for metals and three laboratory duplicates were prepared and analyzed for inorganic parameters and dissolved metals on 55 field sample sites (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
RD-1-T01N-SFW	Surface Water	WAT178S	Metals[1]
CABD4-T01N-SFW	Surface Water	WAT179S	Metals[1]
RR-17-T01N-SFW	Surface Water	WAT180S	Metals[1]
RR-15-T01N-SFW	Surface Water	WAT181S	Metals and Inorganic Parameters[2]
RR-15-D01N-SFW	Surface Water	WAT181S	Dissolved Metals[2]
RR-5-T01N-SFW	Surface Water	WAT182S	Metals and Inorganic Parameters[2]
RR-5-D01N-SFW	Surface Water	WAT182S	Dissolved Metals[2]
RR-10-T01N-SFW	Surface Water	WAT182S	Metals and Inorganic Parameters[2]
RR-10-D01N-SFW	Surface Water	WAT182S	Dissolved Metals[2]
RRS-18-T01N-SFW	Surface Water	WAT183S	Metals[1]
RR-1-T01N-SFW	Surface Water	WAT184S	Metals[1]
RB05T-SFW	Surface Water	WAT185S	Metals[1]

[1] Additional QC samples

[2] Planned QA samples; additional volume collected and QC analyses requested on COC.

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤20% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL. For metals data, the CRDL is used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL and the IDL was considered to be too low to be used as the baseline for these concentration dependent evaluations.

With one exception, the relative percent differences (RPDs) or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within QAPP acceptance limits. The exceptions and the resultant data qualifiers are summarized in the table below.

Analyte	Sample ID	Criterion	Criterion Exceedance	Action
Iron	RR-17-T01N-SFW	$\lvert$Diff$\rvert$ <CRDL	1.1xCRDL	J D-I for parent sample only.

Qualification was limited to parent sample because the exceedence was small and only one of eight results was outside of the QC acceptance range.

4.3 SERIAL DILUTION RESULTS

Serial dilution tests involve the analysis of a sample and a five-fold dilution of the same sample. When analyte concentrations are sufficiently high (i.e., greater that 50x the instrument detection limit [IDL]), the original result and diluted sample result are expected to be fairly comparable. If the results are not comparable, it is generally assumed that there are matrix interferences that are resulting in the suppression of elevation of the signal for one or more analytes.

The original and diluted sample results are compared by a percent difference (%D). When %Ds <10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate that the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result. As illustrated by the table below, serial dilution tests were conduced on three surface water sample sets, with an additional six samples having serial dilution tests performed on only the total metals fraction of the sample.

Sample ID	Matrix	Data Package	Analyses
LR-13-T01N-SFW	Surface Water	WAT132S	Metals
LR-1-T01N-SFW	Surface Water	WAT133S	Metals
RR-16-T01N-SFW	Surface Water	WAT134S	Metals
RR-16-D01N-SFW	Surface Water	WAT134S	Dissolved Metals
LR-5-T01N-SFW	Surface Water	WAT135S	Metals
RR-4-T01N-SFW	Surface Water	WAT138S	Metals
RR-3-T01N-SFW	Surface Water	WAT139S	Metals
RR-3-D01N-SFW	Surface Water	WAT139S	Dissolved Metals
HANSEN CREEK-T01N-SFW	Surface Water	WAT141A	Metals
UFLMID-T01N-SFW	Surface Water	WAT142S	Metals
UFLMID-D01N-SFW	Surface Water	WAT142S	Dissolved Metals
UPPERCABRESTO-T01N-SFW	Surface Water	WAT143S	Metals

A number of %Ds between the original sample results and the result obtained from a sample diluted 1:5 were >10%. In general, qualification was generally limited to the parent samples if less than a quarter of the valid serial dilution results for a given metal were outside of the acceptance range. Conversely, qualification was generally considered necessary if more than a quarter of the results for a metal were outside the acceptance range. However, factors such as the number of valid measurements relative to the size of the sample set the average %D, and the magnitude of outages were also taken into consideration. The table below summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued.

Analyte	Total Metals					Dissolved Metals					Action
	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		
				Low	High				Low	High	
Aluminum	0					0					None
Antimony	0					0					None
Arsenic	0					0					None
Barium	4	0	3.6	0	0	2	0	1.9	0	0	None
Beryllium	0					0					None
Boron	0					0					None
Cadmium	0					0					None
Calcium	4	0	2.9	0	0	2	0	3.6	0	0	None
Chromium	0					0					None
Cobalt	0					0					None
Copper	0					0					None
Iron	0					0					None
Lead	0					0					None
Magnesium	4	0	3.2	0	0	2	0	0.9	0	0	None
Manganese	3	0	0.7	0	0	2	0	0.5	0	0	None
Molybdenum	0					0					None
Selenium	0					0					None
Nickel	0					0					None
Silver	0					0					None
Potassium	2	2	48.2	2	0	1	1	62.3	1	0	J DL-L for all samples.
Thallium	0					0					None
Vanadium	0					0					None
Sodium	0					0					None
Zinc	1	1	18.9	1	0	0					J DL-L for parent sample only (RR-17-T01N-SFW).

Potassium and zinc exhibited valid serial dilution results, as well as average differences, outside QC acceptance limits. Potassium SD qualification was applied to all sample results because all appreciable serial dilution results were out and the deviations were not marginal. However, for zinc, qualification was limited to the parent sample only because it could not be assessed whether or not a systematic problem existed based on only one applicable result.

The site-specific blanks (field and rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

5.1 FIELD DUPLICATE RESULTS

The table below presents the field duplicates collected for this event. As three field duplicate sample pairs were prepared and analyzed for metals, dissolved metals and inorganic parameters for 55 field sample sites (excluding the field duplicate samples), the QAPP frequency for field duplicate QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
LR-8A-T01D-SFW	Surface Water	WAT179S	Metals and Inorganic Parameters
LR-8A-D01D-SFW	Surface Water	WAT179S	Dissolved Metals
RR-11C-T01D-SFW	Surface Water	WAT181S	Metals and Inorganic Parameters
RR-11C-D01D-SFW	Surface Water	WAT181S	Dissolved Metals
RRS-3-T01D-SFW	Surface Water	WAT184S	Metals and Inorganic Parameters
RRS-3-D01D-SFW	Surface Water	WAT184S	Dissolved Metals

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤30% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For field duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than two times the greater RL. For metals data, the CRDL is used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL and the IDL was considered to be too low to be used as the baseline for these concentration dependent evaluations. With two exceptions, the applicable evaluation criterion was met. The exceptions and the resultant data qualifiers are summarized in the table below.

Analyte	Sample ID	Criterion	Criterion Exceedance	Action
Orthophosphate	RR-11C-T01N/T01D-SFW	$\lvert$Diff$\rvert$<2xRL	14.9xRL	J FD-I for parent samples only.
Total Suspended Solids (TSS)	RR-11C-T01N/T01D-SFW	$\lvert$Diff$\rvert$≤30%	32%	J FD-I for parent samples only.

Qualification was limited to parent samples only. For TSS, only 1 of 3 field duplicate results were outside QC acceptance limits and the exceedance was relatively small (32%). Although 1 of 3 results for orthophosphate results were outside QC acceptance limits and exceedence was great (14.9xRL), qualification was limited only to the parent sample because the field duplicate sample result had an orthophosphate/phosphorous total versus partial disagreement which may have resulted in the field duplicate disagreement.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. The rinsate blanks were given field IDs of RB01T/RB01D-SFW through RB03T/RB03D-SFW and RB05T/RB05D-SFW. As four rinsate blanks were prepared and analyzed for metals, dissolved metals and inorganic parameters for 55 field sampling sites, the QAPP frequency for rinsate blank QC samples (5%) was satisfied.

The rinsate blank detections results and the resulting data qualification issued is summarized in the following table. To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result or biasing the average high by using the reporting limit.

Analyte	Sample ID	Conc.	RL	Frequency of Detection	Average RB Concentration	Range for Field Samples	Number of Samples Qualified	Action
TOTAL METALS (ug/L)								
Calcium	RB02T-SFW	92	79	1 of 4	52.6	20,600 to 552,000	0	U RB-I for all sample results ≤263 ug/L
Molybdenum	RB05T-SFW	1.7	0.29	1 of 4	0.53	0.73 to 1,530	40	U RB-I for all sample results ≤2.65 ug/L
DISSOLVED METALS (ug/L)								
Antimony	RB05D-SFW	2.0	0.11	1 of 4	0.54	0.11 to 52	50	U RB-I for all dissolved sample results ≤2.70 ug/L
Iron	RB03D-SFW	1700	44	1 of 4	442	16 to 43,700	3	U RB-I for all dissolved sample results ≤2,210 ug/L
Manganese	RB03D-SFW	6.3	0.66	1 of 4	1.82	0.73 to 82,300	12	U RB-I for all dissolved sample results ≤9.1 ug/L
Molybdenum	RB05D-SFW	1.3	0.29	1 of 4	0.43	0.2 to 1,170	32	U RB-I for all dissolved sample results ≤2.15 ug/L
Vanadium	RB03D-SFW	0.45	0.28	1 of 4	0.22	0.1 to 1.0	48	U RB-I for all dissolved sample results ≤1.1 ug/L
INORGANIC PARAMETERS (mg/L)								
Bicarbonate Alkalinity	RB01T-SFW	1.8	1.0	4 of 4	2.1	1 to 128	0	U RB-I for all sample results ≤10.5 mg/L
	RB02T-SFW	2.4						
	RB03T-SFW	2.2						
	RB05T-SFW	2.0						
Chloride	RB01T-SFW	0.21	0.2	1 of 4	0.13	0.47 to 200	7	U RB-I for all sample results ≤0.65 mg/L
Orthophosphate	RB02T-SFW	0.40	0.4	1 of 4	0.10	0.01 to 26.7	10	U RB-I for all sample results ≤0.50 mg/L
Total Alkalinity	RB01T-SFW	1.8	1.0	4 of 4	2.1	1 to 128	0	U RB-I for all sample results ≤10.5 mg/L
	RB02T-SFW	2.4						
	RB03T-SFW	2.2						
	RB05T-SFW	2.0						

Analyte	Sample ID	Conc.	RL	Frequency of Detection	Average RB Concentration	Range for Field Samples	Number of Samples Qualified	Action
Total Dissolved Solids	RB02T-SFW	12	10	2 of 4	10.5	48 to 6,530	1	U RB-I for all sample results ≤52.5 mg/L
	RB05T-SFW	20						
TKN	RB05T-SFW	0.28	0.5	1 of 4	0.16	0.24 to 0.67	17	U RB-I for all sample results ≤0.80 mg/L

In calculating the average rinsate blank concentration, one half of the RL was used for nondetect results.

While some results were qualified as non-detect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and at relatively low levels.

5.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field blanks are only required by the QAPP when samples are analyzed for organics. Therefore, no field blanks were collected in association with the surface water samples collected during this sample event.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as estimated on the basis of the MS/MSD results, serial dilution results, field duplicate results, or holding time exceedances. A general overall assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

Approximately 97% and 98% of the field duplicate and laboratory results satisfied the applicable criteria, respectively. As such, the overall level of precision demonstrated is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of LCSs and MS/MSDs.

All of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP, which is considered to be indicative of acceptable overall accuracy with respect to the analytical system.

The matrix spike recoveries suggested that the overall accuracy attained with respect to the site-specific sample matrix is satisfactory as 98% of the matrix spike recoveries were within the QAPP acceptance range of 75-125%. Sample results were qualified accordingly as estimated due to low or high matrix spike recoveries.

However, the serial dilution results suggested that very few surface water results might be biased as low because 14.8% of the applicable results did not satisfy the evaluation criterion of a %D<10%. The average percent difference over all applicable serial dilution results was 8.6%. As noted in the data review narrative and the discussion in Section 4, the results have been qualified accordingly.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results reported here for the 58 samples analyzed (55 field samples and 3 field duplicates) are considered usable as qualified for meeting project objective. As such, the completeness for the samples analyzed is 100%, which satisfies the QAPP completeness goal of 80%. Sample LR-4-T/D01N-SFW should have been reported with this report but was cancelled because it was not collected at the proper location. The replacement sample, with the same field

ID, was collected in November in order to preclude a data gap. Due to the temporal separation of the sample events, the replacement sample will be covered in the November 2003 DVR for GRW and SFW.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the surface water samples. The close agreement between the field duplicate results (97%) is considered to indicate that the samples collected are adequately representative of the medium sampled. Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. As noted in Section 6.1, 98% of the laboratory duplicate results satisfied the precision evaluation indicating that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

All RLs obtained, except for cyanide and boron, met the QAPP specified RL requirements for aqueous media for which there was screening level criteria provided in the QAPP or the Baseline Ecological Risk Assessment to which RLs for nondetect analytes could be compared.

Attachments

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT178S

Sampling Event: Fall 2003 Surface Water

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Brian Olmsted

Date Completed: 11/20/03

Peer Reviewer: Stacey Coker

Date Completed: 11/24/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID[2]	Lab ID[3]	Laboratory Form Field ID Abbreviation[4]	Matrix	Analyses			
						Metals	Inorganics	BOD	COD
RB01T-SED	RB	542459	A3J090290-013		W	X	X		
RB02T-SED	RB	542460	A3J090290-014		W	X	X		
RB03T-SED	RB	542461	A3J090290-015		W	X	X		
RB04T-SED	RB	542462	A3J090290-016		W	X	X		
RD-1-T01N-SFW	SA	542407	A3J090290-001	RD-1-TO1N-SFW	W	X	X	X	X
RD-1-D01N-SFW	SA	542408	A3J090290-002	RD-1-DO1N-SFW	W	X			
LR-13-T01N-SFW	SA	542409	A3J090290-003	LR-13-TO1N-SFW	W	X	X	X	X
LR-13-D01N-SFW	SA	542410	A3J090290-004	LR-13-DO1N-SFW	W	X			
SD-1-T01N-SFW	SA	542411	A3J090290-005	SD-1-TO1N-SFW	W	X	X	X	X
SD-1-D01N-SFW	SA	542412	A3J090290-006	SD-1-DO1N-SFW	W	X			
ND-1-T01N-SFW	SA	542413	A3J090290-007	ND-1-TO1N-SFW	W	X	X	X	X
ND-1-D01N-SFW	SA	542414	A3J090290-008	ND-1-DO1N-SFW	W	X			
CD-1-T01N-SFW	SA	542415	A3J090290-009	CD-1-TO1N-SFW	W	X	X	X	X
CD-1-D01N-SFW	SA	542416	A3J090290-010	CD-1-DO1N-SFW	W	X			
LR-16-T01N-SFW	SA	542417	A3J090290-011	LR-16-TO1N-SFW	W	X	X	X	X
LR-16-D01N-SFW	SA	542418	A3J090290-012	LR-16-DO1N-SFW	W	X			

Matrix: S = Solid W = Water
QC Type: SA = Sample RB = Rinsate Blank

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
2 Lab ID used by STL Burlington.
3 Lab ID used by STL North Canton.
4 Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. Included within the STL Burlington case narrative is the table: "Metal Analyses Conducted by STL North Canton". Within this table is the method detection limits (MDL) and North Canton's reporting limits (RL). In keeping with STL Burlington's procedures, and consistent with CLP procedures, the MDL will be used as the RL for the Molycorp RI/FS.

The STL Burlington lab case narrative states that during the cyanide analysis, the initial calibration verification standard yielded a percent recovery that was slightly below control criteria. This was discovered after the holding time had expired, therefore, the samples were not re-analyzed. Upon review, however, the percent recovery was found to be 88.4% which is within the cyanide control limits of 85-115%. Data qualification was not considered necessary.

The STL North Canton lab case narrative stated that the sample duplicate RPD was outside the acceptance limits for some analytes. However, in each case the results were less than five times the reporting limit and the duplicate results agreed within 1x the RL; therefore, no corrective action is required.

All other issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	BOD and COD were not listed on COC, but were logged in at client's request. The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. The coolers were received by North Canton 18 days after samples were collected and at temperatures between 21.2 and 22.0^{o}C. Data qualification was not considered necessary. STL North Canton noted that sample(s) were received or requested after the recommended holding times had expired, were received with insufficient volume, and were received in a broken container. However, all of the requested analyses were conducted within the required holding times and the required reporting limits were attained. As such, the accuracy of this statement is questionable. The reviewer found no evidence of compromised data quality or utility based on COC and sample receipt procedures.
Holding Times	No	For all samples, the 48 hour holding time was exceeded by less than 6 hours for one or more of the following parameters: BOD, nitrate as N, nitrite as N, and orthophosphate. The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. For all samples, the analysis for pH and conductivity were exceeded by 5 hours and 2 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RD-1-T01N-SFW • LD RD-1-T01N-SFW	Yes	All MS and LD results were within the analytical data validation acceptance limits. The matrix quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Method QC • Surrogates • Serial Dilution RB04T-SED • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample RB04T-SFW and was applicable for 0 out of 24 analytes. The serial dilution results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5 except LR-16-T01N-SFW which yielded a value of 1.56. Calculating the TDS independently yielded results for the ratio that were still not within acceptance criteria. Table 1.3 summarizes the results and the resultant data qualification.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB01T-SED RB02T-SED RB03T-SED RB04T-SED • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any field duplicates, field blanks or trip blanks. The field quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	While the calculated intercept for analyte evaluated was near 0, it was not exactly zero (0.18). In order to verify reported results, the intercept had to be set to zero, which agreed with the intercept listed on the calibration summary forms. **(awaiting some feedback from North Canton on this procedure…does instrument do it automatically? This makes the difference between detections and nondetects at values around the IDL)**
Initial/Continuing Calibration Verification	Yes	For some CCV analyses, the internal standard response was not within 20% of the internal standard response for the initial calibration blank as required by the method (i.e. internal standard ratios between 0.80 and 1.20), suggesting potential instrument drift. For these CCVs, the internal standard ratios were within the range of 0.70 to 0.75. Although these internal standard ratios were a bit low, the target analyte recovery for the CCV analyses were all within 90-110% indicating that the method was stable and in control. As such, data qualification was not considered necessary.

Review Parameter	Criteria Met?	Comments
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	While not considered to have an adverse affect on the quality or usability of the data, the laboratory reported ICPMS results as the mean of two replicate analyses rather than three as specified in the method. The reviewer could not verify the reported mercury results by plugging responses into calibration curve because after the initial calibration, the instrument printouts only include calculated concentrations (i.e., the instrument response for each sample is not reported).
Verification	Yes	One minor transcription error was found in the reporting the of the TKN LCS results. For the LCS duplicate pair analyzed on 10/08/03, the LCSD result and recovery in raw data (page 0246) are 2.6 mg/l and 108.3% where as the values reported on the summary form are 2.5 mg/l and 104.2%. Several results for all of the other methods were checked and no other transcription errors were found. It is likely that this one minor transcription error was an isolated occurrence.
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	Yes	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
RD-1-T01N-SFW	---	---	---	---	435 J	7.2 J
LR-13-T01N-SFW	1.4 UJ	0.32 J	---	0.010 UJ	365 J	7.7 J
SD-1-T01N-SFW	---	0.35 J	---	---	297 J	7.7 J
ND-1-T01N-SFW	1.4 UJ	0.27 J	0.0050 UJ	0.010 UJ	300 J	7.7 J
CD-1-T01N-SFW	1.4 UJ	0.37 J	0.0050 UJ	0.010 UJ	302 J	7.7 J
LR-16-T01N-SFW	1.4 UJ	0.31 J	0.0050 UJ	0.010 UJ	367 J	7.8 J
RB01T-SED	---	0.20 UJ	---	---	0.000 J	7.0 J
RB02T-SED	---	0.20 UJ	---	---	0.52 J	5.5 J
RB03T-SED	---	0.20 UJ	---	---	0.000 J	5.5 J
RB04T-SED	---	0.20 UJ	---	---	0.000 J	5.4 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Code
Aluminum (P) DF = 1	0.8	0.86	0.86	0.62	---	0.31	2.9	RB04T-SED	U CCB-I
Antimony (P) DF = 1	0.26	0.34	0.3	0.3	---	0.064	0.11	RD-1-D01N-SFW LR-13-T01N-SFW LR-13-D01N-SFW SD-1-T01N-SFW	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Code
								SD-1-D01N-SFW ND-1-T01N-SFW ND-1-D01N-SFW CD-1-D01N-SFW LR-16-D01N-SFW RB01T-SED	
Beryllium (P) DF = 1	0.3	0.4	0.5	0.5	---	0.11	0.47	LR-13-T01N-SFW SD-1-T01N-SFW ND-1-T01N-SFW CD-1-T01N-SFW	U CCB-I
Boron (P) DF = 1	---	3.9	---	---	---	3.5	4.8	LR-13-T01N-SFW LR-13-D01N-SFW LR-16-T01N-SFW LR-16-D01N-SFW	U CCB-I
Cadmium (P) DF = 1	0.0081	0.01	0.0048	0.0084	---	0.0035	0.089	LR-16-D01N-SFW	U CCB-I
Calcium (P) DF = 1	100.0	103.0	107.0	106.0	139	42.5	79	RB01T-SED RB02T-SED RB03T-SED RB04T-SED	U MB, CCB-I
Magnesium (P) DF = 1	81.1	83.9	79.6	80.3	75.3	11.9	36	RB01T-SED RB02T-SED RB03T-SED RB04T-SED	
Molybdenum (P) DF = 1	0.14	0.15	0.3	0.16	0.13	0.11	0.29	RB02T-SED	U CCB-I
Potassium (P) DF = 1	259.0	266.0	258.0	266.0	252	21.4	35	RB01T-SED RB02T-SED RB03T-SED RB04T-SED	U MB, CCB-I
Vanadium (P) DF = 1	0.27	0.32	0.24	0.3	0.43	0.22	0.28	RD-1-T01N-SFW RD-1-D01N-SFW LR-13-T01N-SFW LR-13-D01N-SFW SD-1-T01N-SFW SD-1-D01N-SFW ND-1-T01N-SFW ND-1-D01N-SFW CD-1-T01N-SFW CD-1-D01N-SFW LR-16-T01N-SFW LR-16-D01N-SFW RB01T-SED RB02T-SED RB03T-SED RB04T-SED	U MB, CCB-I

P = ICP CV = Cold Vapor MB = method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit MDL = Method Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total Dissolved Solids Ratio Results Not Meeting Acceptance Criteria and Data Qualification

Sample	TDS Measured (mg/L)	TDS Calculated by lab	TDS Ratio by lab	TDS Calculated by URS	TDS Ratio by URS	Criteria	Qualification Codes
LR-16-T01N-SFW	186	290	1.56	282	1.52	0.5-1.5	J TvP-L

TDS = Total Dissolved Solids

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT179S

Sampling Event: Fall 2003 Surface Water

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 11/21/03

Peer Reviewer: Stacey Coker

Date Completed: 11/24/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID[2]	Lab ID[3]	Laboratory Form Field ID Abbreviation[4]	Matrix	Analyses			
						Metals	Inorganics	BOD	COD
CABD4-T01N-SFW	SA	542543	A3J090353-001		W	X	X	X	X
CABD4-D01N-SFW	SA	542544	A3J090353-002		W	X			
RB07T-SED	RB	542545	A3J090353-003		W	X	X		
RB08T-SED	RB	542546	A3J090353-004		W	X	X		
RB05T-SED	RB	542547	A3J090353-005		W	X	X		
LR-8A-T01N-SFW	SA	542766	A3J090353-008		W	X	X	X	X
LR-8A-D01N-SFW	SA	542767	A3J090353-009		W	X			
LR-8A-T01D-SFW	FD	542768	A3J090353-010		W	X	X	X	X
LR-8A-D01D-SFW	FD	542769	A3J090353-011		W	X			
LR-5-T01N-SFW	SA	542770	A3J090353-012		W	X	X	X	X
LR-5-D01N-SFW	SA	542771	A3J090353-013		W	X			
RB01T-SFW	RB	542772	A3J090353-014		W	X	X	X	X
RB01D-SFW	RB	542773	A3J090353-015		W	X			
RR-20-T01N-SFW	SA	542774	A3J090353-016		W	X	X	X	X
RR-20-D01N-SFW	SA	542775	A3J090353-017		W	X			
RR-18B-T01N-SFW	SA	542776	A3J090353-018		W	X	X	X	X
RR-18B-D01N-SFW	SA	542777	A3J090353-019		W	X			

Matrix: S = Solid W = Water
QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
2 Lab ID used by STL Burlington.
3 Lab ID used by STL North Canton.
4 Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. Included within the STL Burlington case narrative is the table: "Metal Analyses Conducted by STL North Canton". Within this table is the method detection limits (MDL) and North Canton's reporting limits (RL). In keeping with STL Burlington's procedures, and consistent with CLP procedures, the MDL will be used as the RL for the Molycorp RI/FS.

The STL Burlington lab case narrative states that during the cyanide analysis, the initial calibration verification standard yielded a percent recovery that was slightly below control criteria. This was discovered after the holding time had expired, therefore, the samples were not re-analyzed. Upon review, however, the percent recovery was found to be 88.4% which is within the cyanide control limits of 85-115%. Data qualification was not considered necessary.

At the client's request, samples LR-4-T01N-SFW and LR-4-D01N-SFW were cancelled.

The STL North Canton lab case narrative stated that the sample duplicate RPD was outside the acceptance limits for some analytes. However, in each case the results were less than five times the reporting limit and the duplicate results agreed within 1x the RL; therefore, no corrective action is required.

All other issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. The coolers were received by North Canton 16 and 17 days after samples were collected and at temperatures between 21.2 and 22.0°C. Data qualification was not considered necessary. STL North Canton noted that sample(s) were received or requested after the recommended holding times had expired, were received with insufficient volume, and were received in a broken container. However, all of the requested analyses were conducted within the required holding times and the required reporting limits were attained. As such, the accuracy of this statement is questionable. The reviewer found no evidence of compromised data quality or utility based on COC and sample receipt procedures.
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. For samples collected on 9/22/03, conductivity was measured 1 day after samples were received by lab. For samples collected on 9/23/03, conductivity was measured 7 days after samples were received. For samples collected on 9/22/03, pH was measured 2.5 hours after samples were received by lab. For samples collected on 9/23/03, pH was measured 6 hours after samples were received. Table 1.1 summarizes the holding times not meeting the acceptance criteria and the resulting qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS CABD4-T01N-SFW • LD CABD4-T01N-SFW	Yes	All MS and LD results were within the analytical data validation acceptance limits. The matrix quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution RR-18B-D01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample RR-18B-D01N-SFW and was applicable for 5 out of 24 analytes. Table 1.3 summarizes the one analyte that needed qualification. The serial dilution results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Table 1.4 summarizes the total versus partial results outside the evaluation criteria and the resultant data qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion except sample CABD4 for which the balance yielded –23.40%. The laboratory suspects that the elevated percent difference may be due to the ratio of the generally low metal MDLs to the higher anion RLs (note: the analyte RL is used in the balance calculation for nondetect results). No qualifications were assigned. In calculating the charge balances, it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit for samples RB01T/D-SFW as summarized in Table 1.5. Because the ratio of the calculated TDS (based mostly on detection limit for nondetect results) was significantly lower than the measured and reported TDS, the TDS result was qualified as unusable.
Field QC • Field Duplicate (FD) LR-8A-T01D-SFW LR-8A-D01D-SFW • Rinsate Blank (RB) RB07T-SED RB08T-SED RB05T-SED RB01T-SFW RB01D-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package did not include any field blanks or trip blanks. The field quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
CABD4-T01N-SFW	1.3 UJ	0.20 UJ	0.0050 UJ	0.010 UJ	167 J	8.3 J
RB07T-SED	---	0.20 UJ	---	---	0.27 J	6.9 J
RB08T-SED	---	0.20 UJ	---	---	0.000 J	6.0 J
RB05T-SED	---	0.20 UJ	---	---	0.000 J	6.1 J
LR-8A-T01N-SFW	1.4 UJ	0.32 J	---	---	399 J	7.6 J
LR-8A-T01D-SFW	1.4 UJ	0.34 J	---	---	394 J	7.7 J
LR-5-T01N-SFW	---	---	---	---	328 J	7.7 J
RB01T-SFW	---	---	---	---	0.17 J	6.3 J
RR-20-T01N-SFW	1.4 UJ	0.37 J	0.0050 UJ	0.010 UJ	329 J	7.6 J
RR-18B-T01N-SFW	1.4 UJ	0.42 J	0.0050 UJ	0.010 UJ	310 J	7.9 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
Aluminum (P) DF = 1	1.7	0.64	0.93	0.78	7.6	0.31	2.9	CABD4-D01N-SFW RB07T-SED RB08T-SED RB05T-SED	U MB-I or U MB, CCB-I
Antimony (P) DF = 1	0.29	0.23	0.21	0.26	---	0.064	0.11	CABD4-T01N-SFW RB07T-SED LR-8A-D01N-SFW LR-5-D01N-SFW RB01T-SFW RB01D-SFW	U CCB-I
Beryllium (P) DF = 1	0.3	0.4	0.3	0.4	---	0.11	0.47	RR-18B-T01N-SFW	U CCB-I
Boron (P) DF = 1	3.6	---	---	3.9	---	3.5	4.8	RR-20-D01N-SFW	U CCB-I
Calcium (P) DF = 1	99.8	103.0	100.0	103.0	212	42.5	79	RB07T-SED RB08T-SED RB05T-SED RB01T-SFW RB01D-SFW	U MB, CCB-I
Copper (P) DF = 1	---	---	---	---	1.1	0.017	0.36	CABD4-T01N-SFW CABD4-D01N-SFW RB08T-SED LR-8A-D01N-SFW LR-8A-D01D-SFW LR-5-D01N-SFW RR-20-D01N-SFW RR-18B-D01N-SFW	U MB-I
Lead (P) DF = 1	0.012	0.008	0.01	0.01	0.11	0.0034	0.046	CABD4-T01N-SFW RB07T-SED RB01D-SFW RR-20-D01N-SFW	U MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
Magnesium (P) DF = 1	79.7	80.8	81.1	83.9	87.2	11.9	36	RB07T-SED RB08T-SED RB05T-SED RB01T-SFW RB01D-SFW	U MB, CCB-I
Manganese (P) DF = 1	0.7	0.9	0.8	0.9	0.67	0.15	0.66	RB07T-SED	U MB, CCB-I
Potassium (P) DF = 1	264.0	264.0	259.0	266.0	268	21.4	35	CABD4-T01N-SFW CABD4-D01N-SFW RB07T-SED RB08T-SED RB05T-SED RB01T-SFW RB01D-SFW	U MB, CCB-I

P = ICP CV = Cold Vapor MB = method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit MDL = Method Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
RR-18B-D01N-SFW		
Potassium	62.3	J DL-L

Table 1.4
Total vs. Partial Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Total Metals (ugL)	Dissolved Metals (ug/L)	MDL (ug/L)	Criteria	Qualification Codes
LR-8A-T01N-SFW LR-8A-D01N-SFW	Cobalt	2.3	4.6	1.1	|Diff|>2xRL	J TvP-I
RR-20-T01N-SFW RR-20-D01N-SFW	Chromium	ND	3.9	1	|Diff|>2xRL	

RL = Reporting Limit; RL = MDL for Metals ND = Non-Detect

Table 1.5
Total Dissolved Solids Ratio Results Not Meeting Acceptance Criteria and Data Qualification

Sample	TDS Measured (mg/L)	TDS Calculated (mg/L)	Ratio of Calculated vs. Measured	Ration Acceptance Range	Qualification Code
RB01T/D-SFW	54.0	9	0.17	0.5 to 1.5	R TvP-H

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT180S

Sampling Event: Fall 2003 Surface Water

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 11/24/03

Peer Reviewer: Stacey Coker

Date Completed: 11/26/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID[2]	Lab ID[3]	Laboratory Form Field ID Abbreviation[4]	Matrix	Analyses			
						Metals	Inorganics	BOD	COD
RR-17-T01N-SFW	SA	542785	A3J090355-001		W	X	X	X	X
RR-17-D01N-SFW	SA	542786	A3J090355-002		W	X			
RR-18A-T01N-SFW	SA	542787	A3J090355-003		W	X	X	X	X
RR-18A-D01N-SFW	SA	542788	A3J090355-004		W	X			
RR-16-T01N-SFW	SA	542789	A3J090355-005		W	X	X	X	X
RR-16-D01N-SFW	SA	542790	A3J090355-006		W	X			
LR-11A-T01N-SFW	SA	542791	A3J090355-007		W	X	X	X	X
LR-11A-D01N-SFW	SA	542792	A3J090355-008		W	X			

Matrix: S = Solid W = Water
QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
2 Lab ID used by STL Burlington.
3 Lab ID used by STL North Canton.
4 Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. Included within the STL Burlington case narrative is the table: "Metal Analyses Conducted by STL North Canton". Within this table is the method detection limits (MDL) and North Canton's reporting limits (RL). In keeping with STL Burlington's procedures, and consistent with CLP procedures, the MDL will be used as the RL for the Molycorp RI/FS.

The STL Burlington lab case narrative states that during the cyanide analysis, the initial calibration verification standard yielded a percent recovery that was slightly below control criteria. This was

discovered after the holding time had expired, therefore, the samples were not re-analyzed. Upon review, however, the percent recovery was found to be 88.4% which is within the cyanide control limits of 85-115%. Data qualification was not considered necessary.

The original nitrate analyses for the samples in this delivery group were accomplished within the analytical holding time. However, the associated continuing calibration check standard exhibited no recovery, resulting in the need for re-analysis. The re-analyses were performed 1 day beyond the holding time. Although, the continuing calibration blank yielded a concentration of nitrate that was slightly above the reporting limit, the analytical results from the second analytical sequence were formally reported.

All other issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. The coolers were received by North Canton 16 days after samples were collected and at temperatures between 21.2 and 22.0^{o}C. Data qualification was not considered necessary. STL North Canton noted that sample(s) were received or requested after the recommended holding times had expired, were received with insufficient volume, and were received in a broken container. However, all of the requested analyses were conducted within the required holding times and the required reporting limits were attained. As such, the accuracy of this statement is questionable. The reviewer found no evidence of compromised data quality or utility based on COC and sample receipt procedures.
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. Conductivity was measured 9 days after samples were received by lab and pH was measured 6 hours after samples were received. Table 1.1 summarizes the holding times not meeting the acceptance criteria and the resulting qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RR-17-T01N-SFW • LD RR-17-T01N-SFW	No	All MS results were within the analytical data validation acceptance limits. Table 1.3 summarizes the laboratory duplicate results outside evaluation criteria standards. The matrix quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-17-T01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample RR-17-T01N-SFW and was applicable for 6 out of 24 analytes. Table 1.4 summarizes the two analytes that needed qualification. The serial dilution results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Upon first review of data, LR-11A-T01N-SFW orthophosphorous concentration was greater than 2xRL of phosphorous. However, upon review of rinsate blank detections, the orthophosphorous concentration is now determined to be the reporting limit. Therefore, total versus partial qualification is no longer valid and has been removed. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	N/A	This package did not include any field duplicates, rinsate blanks, field blanks or trip blanks. The field quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Conductivity (umhos/cm)	pH
RR-17-T01N-SFW	---	0.36 J	333 J	7.8 J
RR-18A-T01N-SFW	1.4 UJ	0.37 J	319 J	7.9 J
RR-16-T01N-SFW	---	0.35 J	318 J	7.7 J
LR-11A-T01N-SFW	1.4 UJ	0.33 J	382 J	7.7 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
Antimony (P) DF = 1	0.3	0.32	0.34	---	0.064	0.11	RR-18A-T01N-SFW RR-18A-D01N-SFW RR-16-T01N-SFW RR-16-D01N-SFW LR-11A-T01N-SFW LR-11A-D01N-SFW	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
Copper (P) DF = 1	---	---	---	0.87	0.017	0.36	RR-17-D01N-SFW RR-18A-D01N-SFW RR-16-D01N-SFW LR-11A-D01N-SFW	U MB-I
Vanadium (P) DF = 1	0.3	0.35	0.29	0.34	0.22	0.28	All samples in this package.	U MB, CCB-I

P = ICP CV = Cold Vapor MB = method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit MDL = Method Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Laboratory Duplicate Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Result (ug/L)	Duplicate Result (ug/L)	RPD or |Diff| as a factor of MDL	MDL (ug/L)	Criteria	Qualification Codes
RR-17-T01N-SFW	Iron	423	530	23	44	RPD > 20	J D-I

RL = Reporting Limit; RL = MDL for Metals ND = Non-Detect

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
RR-17-T01N-SFW		
Potassium	48.5	J DL-L
Zinc	18.9	

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT181S

Sampling Event: Fall 2003 Surface Water

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 11/24/03

Peer Reviewer: Stacey Coker

Date Completed: 11/26/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID[2]	Lab ID[3]	Laboratory Form Field ID Abbreviation[4]	Matrix	Analyses			
						Metals	Inorganics	BOD	COD
RR-11C-T01N-SFW	SA	543024	A3J090358-001		W	X	X	X	X
RR-11C-D01N-SFW	SA	543025	A3J090358-002		W	X			
RR-11C-T01D-SFW	FD	543026	A3J090358-003		W	X	X	X	X
RR-11C-D01D-SFW	FD	543027	A3J090358-004		W	X			
RR-12-T01N-SFW	SA	543028	A3J090358-005		W	X	X	X	X
RR-12-D01N-SFW	SA	543029	A3J090358-006		W	X			
LR-1-T01N-SFW	SA	543030	A3J090358-007		W	X	X	X	X
LR-1-D01N-SFW	SA	543031	A3J090358-008		W	X			
RR-15-T01N-SFW	SA	543032	A3J090358-009		W	X	X	X	X
RR-15-D01N-SFW	SA	543033	A3J090358-011		W	X			
RR-6V-T01N-SFW	SA	543034	A3J090358-013		W	X	X	X	X
RR-6V-D01N-SFW	SA	543035	A3J090358-014		W	X			
RR-6A-T01N-SFW	SA	543036	A3J090358-015		W	X	X	X	X
RR-6A-D01N-SFW	SA	543037	A3J090358-016		W	X			
RR-6-T01N-SFW	SA	543038	A3J090358-017		W	X	X	X	X
RR-6-D01N-SFW	SA	543039	A3J090358-018		W	X			
RB03T-SFW	RB	543040	A3J090358-019		W	X	X	X	X
RB03D-SFW	RB	543041	A3J090358-020		W	X			
RR-7-T01N-SFW	SA	543042	A3J090358-021		W	X	X	X	X
RR-7-D01N-SFW	SA	543043	A3J090358-022		W	X			

Matrix: S = Solid W = Water
QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
2 Lab ID used by STL Burlington.
3 Lab ID used by STL North Canton.
4 Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. Included within the STL Burlington case narrative is the table: "Metal Analyses Conducted by STL North Canton". Within this table is the method detection limits (MDL) and North Canton's reporting limits (RL). In keeping with STL Burlington's procedures, and consistent with CLP procedures, the MDL will be used as the RL for the Molycorp RI/FS.

All other issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. The coolers were received by North Canton 16 and 17 days after samples were collected and at temperatures between 21.2 and 22.0°C. Data qualification was not considered necessary. STL North Canton received one unpreserved bottle with sample RR-15-T01N-SFW and sent it back to STL Burlington on 10-13-03. STL North Canton noted that sample(s) were received or requested after the recommended holding times had expired, were received with insufficient volume, and were received in a broken container. However, all of the requested analyses were conducted within the required holding times and the required reporting limits were attained. As such, the accuracy of this statement is questionable. The reviewer found no evidence of compromised data quality or utility based on COC and sample receipt procedures.
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. Conductivity was measured 7 days after samples were received by lab and pH was measured 1 day after samples were received by lab. Table 1.1 summarizes the holding times not meeting the acceptance criteria and the resulting qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RR-15-T01N-SFW RR-15-D01N-SFW • LD RR-15-T01N-SFW RR-15-D01N-SFW	No	Table 1.3 summarizes the matrix spike results outside evaluation criteria standards. All LD results were within the analytical data validation acceptance limits. The matrix quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-7-D01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample RR-7-D01N-SFW and was applicable for 4 out of 24 analytes. All applicable analytes were within evaluation criteria. The serial dilution results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Upon first review of data, LR-1-T01N-SFW orthophosphorous concentration was greater than 2xRL of phosphorous. However, upon review of rinsate blank detections, the orthophosphorous concentration is now determined to be the reporting limit. Therefore, total versus partial qualification is no longer valid and has been removed. Table 1.4 summarizes the total versus partial results outside the evaluation criteria and the resultant data qualifications. The laboratory-generated cation/anion balances were compared against an evaluation

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion except samples RB03T-SFW and RR-7-T/D01N-SFW for which the balance yielded –38.01% and –13.88%, respectively. The laboratory suspects that the elevated percent difference may be due to the ratio of the generally low metal MDLs to the higher anion RLs (note: the analyte RL is used in the balance calculation for nondetect results). No qualifications were assigned. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate (FD) RR-11C-T01D-SFW RR-11C-D01D-SFW • Rinsate Blank (RB) RB03T-SFW RB03D-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package did not include any field blanks or trip blanks. Table 1.5 summarizes the field duplicate results outside the evaluation criteria and the resultant data qualifications. The field quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
RR-11C-T01N-SFW	---	---	---	---	311 J	7.5 J
RR-11C-T01D-SFW	---	---	---	---	315 J	7.6 J
RR-12-T01N-SFW	1.4 UJ	0.39 J	0.0050 UJ	0.010 UJ	321 J	7.9 J
LR-1-T01N-SFW	1.4 UJ	0.41 J	0.0050 UJ	0.34 J	352 J	7.6 J
RR-15-T01N-SFW	1.4 UJ	0.38 J	0.0050 UJ	0.010 UJ	331 J	7.7 J
RR-6V-T01N-SFW	1.4 UJ	0.38 J	0.0050 UJ	0.69 J	247 J	8.2 J

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
RR-6A-T01N-SFW	1.4 UJ	0.37 J	0.0050 UJ	---	263 J	7.8 J
RR-6-T01N-SFW	1.4 UJ	0.36 J	0.0050 UJ	---	273 J	7.9 J
RB03T-SFW	1.4 UJ	0.20 UJ	0.0050 UJ	0.010 UJ	0.41 J	6.6 J
RR-7-T01N-SFW	1.4 UJ	0.36 J	0.0050 UJ	26.7 J	273 J	8.0 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
Aluminum (P) DF = 1	0.9	0.8	0.92	1	13.0	0.31	2.9	RB03T-SFW	U MB, CCB-I
Antimony (P) DF = 1	0.29	0.24	0.27	0.28	0.39	0.064	0.11	RR-11C-T01N-SFW RR-11C-D01N-SFW RR-11C-T01D-SFW RR-11C-D01D-SFW RR-12-T01N-SFW RR-12-D01N-SFW LR-1-D01N-SFW RR-15-T01N-SFW RR-15-D01N-SFW RR-6V-T01N-SFW RR-6V-D01N-SFW RR-6A-T01N-SFW RR-6A-D01N-SFW RR-6-T01N-SFW RR-6-D01N-SFW	U MB, CCB-I or U MB-I
Boron (P) DF = 1	6.0	5.9	5.7	6.1	6.0	3.5	4.8	RR-11C-T01N-SFW RR-11C-D01N-SFW RR-11C-T01D-SFW RR-11C-D01D-SFW RR-12-T01N-SFW RR-12-D01N-SFW LR-1-T01N-SFW LR-1-D01N-SFW RR-15-T01N-SFW RR-15-D01N-SFW RR-6V-T01N-SFW RR-6V-D01N-SFW RR-6A-T01N-SFW RR-6A-D01N-SFW RR-6-D01N-SFW RR-7-T01N-SFW RR-7-D01N-SFW	U MB, CCB-I
Calcium (P) DF = 1	---	---	---	---	157	42.5	79	RB03T-SFW RB03D-SFW	U MB -I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
Copper (P) DF = 1	---	---	---	-0.02	1.5	0.017	0.36	RR-11C-T01N-SFW RR-11C-D01N-SFW RR-11C-T01D-SFW RR-11C-D01D-SFW RR-12-T01N-SFW RR-12-D01N-SFW LR-1-D01N-SFW RR-15-D01N-SFW RR-6V-T01N-SFW RR-6V-D01N-SFW RR-6A-D01N-SFW RR-6-D01N-SFW RR-7-D01N-SFW	U MB-I
Lead (P) DF = 1	0.013	0.0099	0.012	0.01	0.10	0.0034	0.046	RR-11C-T01D-SFW RR-6V-D01N-SFW RR-6A-T01N-SFW RR-7-T01N-SFW	U MB-I
Manganese (P) DF = 1	0.5	0.4	0.5	0.5	---	0.15	0.66	RB03T-SFW	U CCB-I
Potassium (P) DF = 1	173.0	179.0	167.0	220.0	160	21.4	35	RR-6A-D01N-SFW RB03T-SFW RB03D-SFW	U CCB-I or U MB, CCB-I
Sodium (P) DF = 1	-370.0	---	---	-410.0	---	182	260	RB03T-SFW RB03D-SFW	UJ CCB-L
Vanadium (P) DF = 1	0.26	---	---	---	---	0.22	0.28	RR-11C-T01N-SFW RR-11C-T01D-SFW RR-11C-D01D-SFW RR-12-T01N-SFW RR-12-D01N-SFW LR-1-T01N-SFW LR-1-D01N-SFW	U CCB-I
Zinc (P) DF = 1	---	---	---	---	13.7	7.1	13	LR-1-D01N-SFW RR-6V-T01N-SFW RR-6A-T01N-SFW RR-6A-D01N-SFW RR-6-T01N-SFW RR-6-D01N-SFW RR-7-T01N-SFW RR-7-D01N-SFW	U MB-I

P = ICP CV = Cold Vapor MB = method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit MDL = Method Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Sample Result (mg/L)	Matrix Spike Result (mg/L)	Spike Added	% Recovery	Qualification Codes
RR-15-T01N-SFW	Sulfate	97.8	169	100	71.2	J MS-L

RL = Reporting Limit ND = Non-Detect

Table 1.4
Total vs. Partial Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Concentration[1]	RL	Criteria	Qualification Codes
RR-11C-T01D-SFW	Ortho-phosphorous	1.5	0.1	|Diff|>2xRL	J TvP-I or UJ TvP-I
	Phosphorous	0.033	0.010		
RR-6V-T01N-SFW	Ortho-phosphorous	0.69	0.020	|Diff|>2xRL	
	Phosphorous	0.029	0.010		
RR-7-T01N-SFW	Ortho-phosphorous	26.7	1.0	|Diff|>2xRL	
	Phosphorous	0.032	0.010		
RB03T-SFW RB03D-SFW	Iron	ND 1700	44	|Diff|>2xRL	
	Manganese	1.4 U 6.3	1.4	|Diff|>2xRL	

RL = Reporting Limit; RL = Method Detection Limit (MDL) for Metals ND = Non-Detect

[1] Concentrations of metals are in units of ug/L. Concentrations of Orthophosphorous and Phosphorous are in units of mg/L

Table 1.5
Field Duplicate Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Concentration[1]	RL	Criteria	Qualification Codes
RR-11C-T01N-SFW RR-11C-T01D-SFW	Ortho-phosphorous	0.010 U 1.5	0.010	|Diff|>2xRL	J FD-I
	TSS	12.6 9.1	0.5	|Diff|>30%	

RL = Reporting Limit; RL = MDL for Metals ND = Non-Detect

[1] Concentrations of metals are in units of ug/L. Concentrations of Orthophosphorous and Phosphorous are in units of mg/L

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT182S

Sampling Event: Fall 2003 Surface Water

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 11/25/03

Peer Reviewer: Stacey Coker

Date Completed: 11/26/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID[2]	Lab ID[3]	Laboratory Form Field ID Abbreviation[4]	Matrix	Analyses			
						Metals	Inorganics	BOD	COD
RR-13-T01N-SFW	SA	543050	A3J090367-001	RR-13-TO1N-SFW	W	X	X	X	X
RR-13-D01N-SFW	SA	543051	A3J090367-002		W	X			
RR-5-T01N-SFW	SA	543052	A3J090367-003		W	X	X	X	X
RR-5-D01N-SFW	SA	543053	A3J090367-005		W	X			
RR-8-T01N-SFW	SA	543054	A3J090367-007		W	X	X	X	X
RR-8-D01N-SFW	SA	543055	A3J090367-008		W	X			
RR-11A1-T01N-SFW	SA	543056	A3J090367-009		W	X	X	X	X
RR-11A1-D01N-SFW	SA	543057	A3J090367-010		W	X			
RR-11B-T01N-SFW	SA	543058	A3J090367-011		W	X	X	X	X
RR-11B-D01N-SFW	SA	543059	A3J090367-012		W	X			
RR-8A-T01N-SFW	SA	543060	A3J090367-013		W	X	X	X	X
RR-8A-D01N-SFW	SA	543061	A3J090367-014		W	X			
RR-10A1-T01N-SFW	SA	543062	A3J090367-015		W	X	X	X	X
RR-10A1-D01N-SFW	SA	543063	A3J090367-016		W	X			
RR-10-T01N-SFW	SA	543064	A3J090367-017		W	X	X	X	X
RR-10-D01N-SFW	SA	543065	A3J090367-019		W	X			
RR-14-T01N-SFW	SA	543066	A3J090367-021		W	X	X	X	X
RR-14-D01N-SFW	SA	543067	A3J090367-022		W	X			
RB02T-SFW	RB	543068	A3J090367-023		W	X	X	X	X
RB02D-SFW	RB	543069	A3J090367-024		W	X			

Matrix: S = Solid W = Water
QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
2 Lab ID used by STL Burlington.
3 Lab ID used by STL North Canton.
4 Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. Included within the STL Burlington case narrative is the table: "Metal Analyses Conducted by STL North Canton". Within this table is the method detection limits (MDL) and North Canton's reporting limits (RL). In keeping with STL Burlington's procedures, and consistent with CLP procedures, the MDL will be used as the RL for the Molycorp RI/FS.

All other issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. The coolers were received by North Canton 16 and 17 days after samples were collected and at temperatures between 21.2 and 22.0^{o}C. Data qualification was not considered necessary. STL North Canton noted that sample(s) were received or requested after the recommended holding times had expired, were received with insufficient volume, and were received in a broken container. However, all of the requested analyses were conducted within the required holding times and the required reporting limits were attained. As such, the accuracy of this statement is questionable. The reviewer found no evidence of compromised data quality or utility based on COC and sample receipt procedures.
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. Conductivity was measured 7 days after samples were received by lab and pH was measured 6 hours after samples were received by lab. Table 1.1 summarizes the holding times not meeting the acceptance criteria and the resulting qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RR-5-T01N-SFW RR-5-D01N-SFW RR-10-T01N-SFW RR-10-D01N-SFW • LD RR-5-T01N-SFW RR-5-D01N-SFW RR-10-T01N-SFW RR-10-D01N-SFW	No	Table 1.3 summarizes the matrix spike results outside evaluation criteria standards. All LD results were within the analytical data validation acceptance limits. The matrix quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution RR-13-T01N-SFW RB02D-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on sample RR-13-T01N-SFW was applicable for 5 out of 12 analytes. The result for one analyte was not within evaluation criteria. The serial dilution analysis conducted on sample RB02D-SFW was applicable for 0 out of 12 analytes. Table 1.4 summarizes the serial dilution result outside the evaluation criteria and the resultant data qualification. The serial dilution results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Upon first review of data, RR-15-T/D01N-SFW and RR-10-T/D01N-SFW total molybdenum concentrations were greater than 2xRL of dissolved molybdenum concentrations. However, upon review of rinsate blank detections, the molybdenum concentrations are now determined to be the reporting limit. Therefore, total versus partial qualifications are no longer valid and have been removed. Table 1.5 summarizes the total versus partial results outside the evaluation criteria and the resultant data qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion except RB02T/D-SFW for which the balance yielded –77.69%. No qualification was necessary due to analytes results being non-detect. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB02T-SFW RB02D-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package did not include any field duplicates, field blanks or trip blanks. The field quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
RR-13-T01N-SFW	---	0.36 J	0.0050 UJ	---	311 J	7.8 J
RR-5-T01N-SFW	---	0.41 J	0.0052 J	---	231 J	8.2 J
RR-8-T01N-SFW	1.4 UJ	0.36 J	0.0050 UJ	0.010 UJ	253 J	8.0 J
RR-11A1-T01N-SFW	1.4 UJ	0.34 J	0.0050 UJ	0.020 UJ	242 J	8.1 J
RR-11B-T01N-SFW	1.4 UJ	0.33 J	0.0050 UJ	0.010 UJ	262 J	7.7 J
RR-8A-T01N-SFW	1.4 UJ	0.35 J	0.0050 UJ	---	258 J	8.2 J
RR-10A1-T01N-SFW	1.4 UJ	0.33 J	0.0050 UJ	0.012 J	253 J	8.2 J
RR-10-T01N-SFW	1.4 UJ	0.33 J	0.0050 UJ	---	271 J	7.9 J
RR-14-T01N-SFW	1.4 UJ	0.37 J	0.0050 UJ	---	317 J	7.7 J
RB02T-SFW	1.4 UJ	0.20 UJ	0.0050 UJ	---	0.26 J	7.1 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
Antimony (P) DF = 1	0.26	0.24	0.22	0.29	---	0.064	0.11	RR-13-T01N-SFW RR-13-D01N-SFW RR-5-T01N-SFW RR-5-D01N-SFW RR-8-T01N-SFW RR-8-D01N-SFW RR-11A1-T01N-SFW RR-11A1-D01N-SFW RR-11B-T01N-SFW RR-11B-D01N-SFW RR-8A-D01N-SFW RR-10A1-D01N-SFW RR-10-D01N-SFW RR-14-T01N-SFW RR-14-D01N-SFW RB02T-SFW RB02D-SFW	U CCB-I
Boron (P) DF = 1	6.1	6.2	5.5	5.6	---	3.5	4.8	RR-13-T01N-SFW RR-13-D01N-SFW RR-5-T01N-SFW RR-5-D01N-SFW RR-8-T01N-SFW RR-8-D01N-SFW RR-11A1-T01N-SFW RR-11A1-D01N-SFW RR-11B-T01N-SFW RR-11B-D01N-SFW RR-8A-T01N-SFW RR-8A-D01N-SFW RR-10A1-T01N-SFW RR-10A1-D01N-SFW	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
								RR-10-T01N-SFW RR-10-D01N-SFW RR-14-T01N-SFW RR-14-D01N-SFW	
Beryllium (P) DF = 1	0.5	0.4	0.4	0.4	---	0.22	0.47	RR-13-T01N-SFW	U CCB-I
Lead (P) DF = 1	0.01	0.011	0.0092	0.013	---	0.0034	0.046	RR-11B-D01N-SFW	U CCB-I
Potassium (P) DF = 1	220.0	158.0	175.0	223.0	145	21.4	35	RB02T-SFW RB02D-SFW	U MB, CCB-I
Sodium (P) DF = 1	-140.0	-320.0	-280.0	-290.0	---	182	260	RB02T-SFW RB02D-SFW	UJ CCB-L
Thallium (P) DF = 1	0.0058	0.0052	---	0.0056	---	0.0047	0.015	RR-10-T01N-SFW	U CCB-I
Vanadium (P) DF = 1	---	---	---	0.26	---	0.22	0.28	RR-14-T01N-SFW RR-14-D01N-SFW RB02T-SFW RB02D-SFW	U CCB-I

P = ICP CV = Cold Vapor MB = method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit MDL = Method Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Sample Result (ug/L)	Matrix Spike Result (ug/L)	Spike Added	% Recovery	Qualification Codes
RR-5-T01N-SFW	Orthophosphorous	0.019	0.16	0.111	127.0	J MS-H
	Sulfate	45.2	76.0	50.0	61.6	J MS-L
RR-10-T01N-SFW	Sulfate	76.8	146	100	69.2	J MS-L

RL = Reporting Limit ND = Non-Detect

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
RR-13-T01N-SFW		
Potassium	47.9	J DL-L

Table 1.5
Total vs. Partial Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Concentration[1]	RL	Criteria	Qualification Codes
RB02T-SFW	Orthophosphorous	0.40	0.010	|Diff|>2xRL	J TvP-I or UJ TvP-I
	Phosphorous	0.010	0.010		

RL = Reporting Limit; RL = Method Detection Limit (MDL) for Metals ND = Non-Detect
[1] Concentrations of metals are in units of ug/L. Concentrations of Orthophosphorous and Phosphorous are in units of mg/L

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT183S

Sampling Event: Fall 2003 Surface Water

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 11/26/03

Peer Reviewer: Stacey Coker

Date Completed: 11/26/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID[2]	Lab ID[3]	Laboratory Form Field ID Abbreviation[4]	Matrix	Analyses			
						Metals	Inorganics	BOD	COD
RRS-18-T01N-SFW	SA	543281	A3J090372-001		W	X	X	X	X
RRS-18-D01N-SFW	SA	543282	A3J090372-002	RRS-15-D01N-SFW	W	X			
RRS-15-T01N-SFW	SA	543283	A3J090372-003		W	X	X	X	X
RRS-15-D01N-SFW	SA	543284	A3J090372-004		W	X			
UNIQUE3-T01N-SFW	SA	543285	A3J090372-005		W	X	X	X	X
UNIQUE3-D01N-SFW	SA	543286	A3J090372-006		W	X			
UNIQUE4-T01N-SFW	SA	543287	A3J090372-007		W	X	X	X	X
UNIQUE4-D01N-SFW	SA	543288	A3J090372-008		W	X			
RRS-20-T01N-SFW	SA	543289	A3J090372-009		W	X	X	X	X
RRS-20-D01N-SFW	SA	543290	A3J090372-010		W	X			
ZWERGEL-T01N-SFW	SA	543291	A3J090372-011		W	X	X	X	X
ZWERGEL-D01N-SFW	SA	543292	A3J090372-012		W	X			
UPPERCABRESTO-T01N-SFW	SA	543293	A3J090372-013	UPPERCABRES-T01N-SF, UPPERCABRES-T01N-SFW	W	X	X	X	X
UPPERCABRESTO-D01N-SFW	SA	543294	A3J090372-014	UPPERCABRES-D01N-SF, UPPERCABRES-D01N-SFW	W	X			
RR-4-T01N-SFW	SA	543295	A3J090372-015		W	X	X	X	X
RR-4-D01N-SFW	SA	543296	A3J090372-016		W	X			
UFLIN-T01N-SFW	SA	543297	A3J090372-017		W	X	X	X	X
UFLIN-D01N-SFW	SA	543298	A3J090372-018		W	X			
UFLMID-T01N-SFW	SA	543299	A3J090372-019		W	X	X	X	X
UFLMID-D01N-SFW	SA	543300	A3J090372-020		W	X			

Matrix: S = Solid W = Water
QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
2 Lab ID used by STL Burlington.
3 Lab ID used by STL North Canton.
4 Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. Included within the STL Burlington case narrative is the table: "Metal Analyses Conducted by STL North Canton". Within this table is the method detection limits (MDL) and North Canton's reporting limits (RL). In keeping with STL Burlington's procedures, and consistent with CLP procedures, the MDL will be used as the RL for the Molycorp RI/FS.

All other issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. The coolers were received by North Canton 14 days after samples were collected and at temperatures between 21.2 and 22.0^{o}C. Data qualification was not considered necessary. STL North Canton noted that RRS-18-D01N-SFW was incorrectly logged in as RRS-15-D01N-SFW based on bottle label. STL North Canton noted that sample(s) were received or requested after the recommended holding times had expired, were received with insufficient volume, and were received in a broken container. However, all of the requested analyses were conducted within the required holding times and the required reporting limits were attained. As such, the accuracy of this statement is questionable. The reviewer found no evidence of compromised data quality or utility based on COC and sample receipt procedures.
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. Conductivity was measured 7 days after samples were received by lab and pH was measured 6 hours after samples were received by lab. Table 1.1 summarizes the holding times not meeting the acceptance criteria and the resulting qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RRS-18-T01N-SFW • LD RRS-18-T01N-SFW	Yes	All MS and LD results were within the evaluation criteria standards. The matrix quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RRS-18-T01N-SFW UFLMID-D01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on sample RRS-18-T01N-SFW was applicable for 4 out of 12 analytes. Results for all four analytes were within evaluation criteria. The serial dilution analysis conducted on sample UFLMID-D01N-SFW was applicable for 0 out of 12 analytes. The serial dilution results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Upon first review of data, UNIQUE4-T01N-SFW orthophosphorous concentration was greater than 2xRL of phosphorous. However, upon review of rinsate blank detections, the orthophosphorous concentration is now determined to be the reporting limit. Therefore, total versus partial qualification is no longer valid and has been removed.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		Table 1.3 summarizes the total versus partial results outside the evaluation criteria and the resultant data qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5 except for samples collected from locations RRS-15, RRS-18 and ZWERGEL. The TDS ratios for each of these three samples were all greater than 1.5. Calculating the TDS independently yielded values for the ratio that were still greater than 1.5 except for RRS-18 which yielded a value of 1.5. Table 1.4 summarizes the results and the resultant data qualification.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	N/A	This package did not include any field duplicates, rinsate blanks, field blanks or trip blanks. The field quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
RRS-18-T01N-SFW	1.4 UJ	0.20 UJ	0.0050 UJ	0.010 UJ	148 J	8.3 J
RRS-15-T01N-SFW	1.4 UJ	0.35 J	0.0050 UJ	---	123 J	8.1 J
UNIQUE3-T01N-SFW	---	---	---	---	331 J	7.3 J
UNIQUE4-T01N-SFW	---	---	---	---	259 J	7.5 J
RRS-20-T01N-SFW	---	0.29 J	---	---	152 J	7.7 J
ZWERGEL-T01N-SFW	1.4 UJ	0.29 J	0.0050 UJ	---	181 J	8.2 J
UPPERCABRESTO-T01N-SFW	1.4 UJ	0.20 UJ	0.0050 UJ	0.010 UJ	135 J	8.0 J

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
RR-4-T01N-SFW	2.0 J	0.29 J	0.0050 UJ	0.010 UJ	225 J	7.9 J
UFLIN-T01N-SFW	1.4 UJ	0.40 J	---	---	230 J	8.0 J
UFLMID-T01N-SFW	---	0.41 J	---	---	236 J	8.1 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
Aluminum (P) DF = 1	1.3	1.6	1.7	0.64	---	5.5	0.31	2.9	RRS-18-D01N-SFW RRS-15-D01N-SFW RRS-20-T01N-SFW RRS-20-D01N-SFW UPPERCABRESTO-D01N-SFW	U MB, CCB-I or U MB-I
Antimony (P) DF = 1	0.26	0.32	0.29	0.23	---	---	0.064	0.11	RRS-15-T01N-SFW RRS-15-D01N-SFW UNIQUE3-T01N-SFW UNIQUE3-D01N-SFW UNIQUE4-T01N-SFW UNIQUE4-D01N-SFW RRS-20-T01N-SFW RRS-20-D01N-SFW ZWERGEL-D01N-SFW UPPERCABRESTO-D01N-SFW UFLIN-D01N-SFW UFLMID-T01N-SFW UFLMID-D01N-SFW	U CCB-I
Boron (P) DF = 1	---	---	---	---	3.7	---	3.5	4.8	UFLMID-T01N-SFW UFLMID-D01N-SFW	U CCB-I
Copper (P) DF = 1	---	---	---	---	---	1.9	0.017	0.36	RRS-18-T01N-SFW RRS-18-D01N-SFW RRS-15-T01N-SFW RRS-15-D01N-SFW UNIQUE3-D01N-SFW UNIQUE4-T01N-SFW UNIQUE4-D01N-SFW RRS-20-T01N-SFW RRS-20-D01N-SFW ZWERGEL-T01N-SFW ZWERGEL-D01N-SFW UPPERCABRESTO-T01N-SFW UPPERCABRESTO-D01N-SFW RR-4-D01N-SFW UFLIN-T01N-SFW UFLIN-D01N-SFW UFLMID-T01N-SFW UFLMID-D01N-SFW	U MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
Lead (P) DF = 1	0.0082	0.012	0.012	0.008	---	0.69	0.0034	0.046	RRS-18-T01N-SFW RRS-15-T01N-SFW UNIQUE3-T01N-SFW UNIQUE4-T01N-SFW RRS-20-T01N-SFW RRS-20-D01N-SFW ZWERGEL-T01N-SFW UPPERCABRESTO-T01N-SFW RR-4-T01N-SFW UFLIN-D01N-SFW	U MB-I or U MB, CCB-I
Manganese (P) DF = 1	0.8	0.7	0.9	0.8	1.0	---	0.15	0.66	RRS-15-D01N-SFW ZWERGEL-T01N-SFW ZWERGEL-D01N-SFW UPPERCABRESTO-T01N-SFW UPPERCABRESTO-D01N-SFW	U CCB-I
Nickel (P) DF = 1	---	---	---	---	---	0.90	0.024	0.51	RRS-18-T01N-SFW RRS-18-D01N-SFW RRS-15-T01N-SFW RRS-15-D01N-SFW RRS-20-T01N-SFW RRS-20-D01N-SFW ZWERGEL-T01N-SFW ZWERGEL-D01N-SFW UPPERCABRESTO-T01N-SFW UPPERCABRESTO-D01N-SFW UFLMID-D01N-SFW	U MB-I
Potassium (P) DF = 1	264.0	265.0	258.0	263.0	273.0	253	21.4	35	RRS-18-T01N-SFW RRS-18-D01N-SFW RRS-15-T01N-SFW RRS-15-D01N-SFW RRS-20-T01N-SFW RRS-20-D01N-SFW ZWERGEL-T01N-SFW ZWERGEL-D01N-SFW UPPERCABRESTO-T01N-SFW UPPERCABRESTO-D01N-SFW RR-4-T01N-SFW RR-4-D01N-SFW UFLMID-D01N-SFW	U MB, CCB-I

P = ICP CV = Cold Vapor MB = method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit MDL = Method Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Concentration[1]	RL	Criteria	Qualification Codes
RRS-20-T01N-SFW	Orthophosphorous	0.87	0.020	|Diff| >2xRL	J TvP-I or UJ TvP-I
	Phosphorous	0.010	0.010		

RL = Reporting Limit; RL = Method Detection Limit (MDL) for Metals ND = Non-Detect

[1] Concentrations of metals are in units of ug/L. Concentrations of Orthophosphorous and Phosphorous are in units of mg/L

Table 1.4
Total Dissolved Solids Ratio Results Not Meeting Acceptance Criteria and Data Qualification

Sample	TDS Measured (mg/L)	TDS Calculated by lab	TDS Ratio by lab	TDS Calculated by URS	TDS Ratio by URS	Criteria	Qualification Codes
RRS-18-T01N-SFW	84	134	1.60	126	1.50	0.5-1.5	No Qualification
RRS-15-T01N-SFW	48	114	2.38	106	2.21		J TvP-L
ZWERGEL-T01N-SFW	90	159	1.77	151	1.68		J TvP-L

TDS = Total Dissolved Solids

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT184S

Sampling Event: Fall 2003 Surface Water

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 12/01/03

Peer Reviewer: Stacey Coker

Date Completed: 12/01/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID[2]	Lab ID[3]	Laboratory Form Field ID Abbreviation[4]	Matrix	Analyses			
						Metals	Inorganics	BOD	COD
RR-1-T01N-SFW	SA	543301	A3J090398-001		W	X	X	X	X
RR-1-D01N-SFW	SA	543302	A3J090398-002		W	X			
RR-13-T01N-SFW	SA	543303	A3J090398-003		W	X	X	X	X
RR-13-D01N-SFW	SA	543304	A3J090398-004		W	X			
UNIQUE5-T01N-SFW	SA	543305	A3J090398-005		W	X	X	X	X
UNIQUE5-D01N-SFW	SA	543306	A3J090398-006		W	X			
UNIQUE6-T01N-SFW	SA	543307	A3J090398-007		W	X	X	X	X
UNIQUE6-D01N-SFW	SA	543308	A3J090398-008		W	X			
ERLMID-T01N-SFW	SA	543309	A3J090398-009		W	X	X	X	X
ERLMID-D01N-SFW	SA	543310	A3J090398-010		W	X			
ERLOUT-T01N-SFW	SA	543311	A3J090398-011		W	X	X	X	X
ERLOUT-D01N-SFW	SA	543312	A3J090398-012		W	X			
RRS-12-T01N-SFW	SA	543313	A3J090398-013		W	X	X	X	X
RRS-12-D01N-SFW	SA	543314	A3J090398-014		W	X			
RRS-9-T01N-SFW	SA	543315	A3J090398-015		W	X	X	X	X
RRS-9-D01N-SFW	SA	543316	A3J090398-016		W	X			
RR-3-T01N-SFW	SA	543317	A3J090398-017		W	X	X	X	X
RR-3-D01N-SFW	SA	543318	A3J090398-018		W	X			
RR-3-T01D-SFW	FD	543319	A3J090398-019		W	X	X	X	X
RR-3-D01D-SFW	FD	543320	A3J090398-020		W	X			

Matrix: S = Solid W = Water
QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
2 Lab ID used by STL Burlington.
3 Lab ID used by STL North Canton.
4 Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. Included within the STL Burlington case narrative is the table: "Metal Analyses Conducted by STL North Canton". Within this table is the method detection limits (MDL) and North Canton's reporting limits (RL). In keeping with STL Burlington's procedures, and consistent with CLP procedures, the MDL will be used as the RL for the Molycorp RI/FS.

All other issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. The coolers were received by North Canton between 14 and 15 days after samples were collected and at temperatures between 21.2 and 22.0^{o}C. Data qualification was not considered necessary. STL North Canton noted that sample(s) were received or requested after the recommended holding times had expired, were received with insufficient volume, and were received in a broken container. However, all of the requested analyses were conducted within the required holding times and the required reporting limits were attained. As such, the accuracy of this statement is questionable. The reviewer found no evidence of compromised data quality or utility based on COC and sample receipt procedures.
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. Conductivity was measured 5 days after samples were received by lab and pH was measured 4 hours after samples were received by lab. Table 1.1 summarizes the holding times not meeting the acceptance criteria and the resulting qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RR-1-T01N-SFW • LD RR-1-T01N-SFW	Yes	All MS results were within the evaluation criteria standards except for mercury which yielded a recovery of 126%. However, the mercury sample concentration was non-detect and the percent recovery was calculated using zero as the sample concentration. If the MDL value of 0.067ug/L is used instead, a recovery of 123%is calculated. Therefore, no qualification is assigned. All LD results were within the evaluation criteria standards. The matrix quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-1-T01N-SFW RR-3-D01D-SFW • Internal Standards • Total vs. Partial Analyses	No	The serial dilution analysis conducted on sample RR-1-T01N-SFW was applicable for 3 out of 12 analytes. All analytes were within evaluation criteria. The serial dilution analysis conducted on sample RR-3-D01D-SFW was applicable for 0 out of 12 analytes. The serial dilution results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Upon first review of data, RRS-12-T01N-SFW orthophosphorous concentration was greater than 2xRL of phosphorous. However, upon review of rinsate blank detections,

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
• Cation/Anion Balance		the orthophosphorous concentration is now determined to be the reporting limit. Therefore, total versus partial qualification is no longer valid and has been removed. Table 1.4 summarizes the total versus partial results outside the evaluation criteria and the resultant data qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate (FD) RR-3-T01D-SFW RR-3-D01D-SFW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package did not include any rinsate blanks, field blanks or trip blanks. All field duplicate results were within the evaluation criteria standards. The field quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
RR-1-T01N-SFW	1.7 J	0.52 J	0.0050 UJ	---	176 J	8.1 J
RR-13-T01N-SFW	2.1 J	0.20 UJ	0.0050 UJ	---	120 J	7.8 J
UNIQUE5-T01N-SFW	---	---	---	---	263 J	7.6 J
UNIQUE6-T01N-SFW	---	---	---	---	809 J	7.5 J
ERLMID-T01N-SFW	1.4 UJ	0.33 J	0.0050 UJ	0.010 UJ	315 J	7.9 J
ERLOUT-T01N-SFW	1.4 UJ	0.32 J	0.0050 UJ	---	314 J	7.8 J
RRS-12-T01N-SFW	---	0.20 UJ	---	---	185 J	7.6 J

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
RRS-9-T01N-SFW	---	0.20 UJ	---	---	154 J	7.6 J
RR-3-T01N-SFW	1.4 UJ	0.27 J	0.0050 UJ	0.010 UJ	207 J	7.7 J
RR-3-T01D-SFW	1.4 J	0.26 J	0.0050 UJ	0.010 UJ	209 J	7.6 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
Aluminum (P) DF = 1	1.4	0.71	0.8	0.86	10.8	0.31	2.9	RR-1-T01N-SFW RR-1-D01N-SFW RR-13-D01N-SFW UNIQUE6-D01N-SFW RRS-9-T01N-SFW RRS-9-D01N-SFW	U MB, CCB-I or U MB-I
Antimony (P) DF = 1	0.23	0.3	0.26	0.34	---	0.064	0.11	RR-13-T01N-SFW RR-13-D01N-SFW UNIQUE5-T01N-SFW UNIQUE5-D01N-SFW UNIQUE6-T01N-SFW UNIQUE6-D01N-SFW ERLMID-T01N-SFW ERLMID-D01N-SFW ERLOUT-D01N-SFW RRS-12-D01N-SFW RR-3-T01N-SFW RR-3-D01N-SFW RR-3-T01D-SFW RR-3-D01D-SFW	U CCB-I
Copper (P) DF = 1	---	---	---	---	2.0	0.017	0.36	RR-1-T01N-SFW RR-1-D01N-SFW RR-13-T01N-SFW RR-13-D01N-SFW UNIQUE5-T01N-SFW UNIQUE5-D01N-SFW UNIQUE6-T01N-SFW UNIQUE6-D01N-SFW ERLMID-T01N-SFW ERLMID-D01N-SFW ERLOUT-T01N-SFW ERLOUT-D01N-SFW RRS-12-T01N-SFW RRS-12-D01N-SFW RRS-9-T01N-SFW RRS-9-D01N-SFW RR-3-D01N-SFW RR-3-D01D-SFW	U MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
Iron (P) DF = 1	---	---	---	---	63.8	13.3	44	RR-1-T01N-SFW RR-13-T01N-SFW UNIQUE5-D01N-SFW RRS-12-T01N-SFW RRS-9-T01N-SFW RR-3-T01N-SFW RR-3-T01D-SFW	U MB-I
Lead (P) DF = 1	0.012	0.0085	0.0077	0.0088	0.59	0.0034	0.046	RR-1-T01N-SFW RR-1-D01N-SFW RR-13-T01N-SFW UNIQUE6-T01N-SFW ERLMID-T01N-SFW ERLOUT-T01N-SFW ERLOUT-D01N-SFW RRS-12-T01N-SFW RRS-9-T01N-SFW RRS-9-D01N-SFW RR-3-T01N-SFW RR-3-T01D-SFW	U MB, CCB-I or U MB-I
Manganese (P) DF = 1	0.8	0.8	0.8	0.7	1.1	0.15	0.66	RR-1-T01N-SFW RR-1-D01N-SFW RR-13-T01N-SFW RR-13-D01N-SFW	U MB, CCB-I or U MB-I
Molybdenum (P) DF = 1	0.35	0.14	0.15	0.3	---	0.11	0.29	RR-13-T01N-SFW RR-13-D01N-SFW RRS-9-T01N-SFW RR-3-T01N-SFW RR-3-D01N-SFW RR-3-T01D-SFW RR-3-D01D-SFW	U CCB-I
Nickel (P) DF = 1	---	---	---	---	1.3	0.024	0.51	RR-1-T01N-SFW RR-1-D01N-SFW RR-13-T01N-SFW RR-13-D01N-SFW UNIQUE6-T01N-SFW UNIQUE6-D01N-SFW RRS-12-T01N-SFW RRS-12-D01N-SFW RRS-9-T01N-SFW RRS-9-D01N-SFW RR-3-T01N-SFW RR-3-D01N-SFW RR-3-T01D-SFW RR-3-D01D-SFW	U MB-I
Potassium (P) DF = 1	262.0	260.0	264.0	265.0	246	21.4	35	RR-1-T01N-SFW RR-1-D01N-SFW RR-13-T01N-SFW RR-13-D01N-SFW UNIQUE5-D01N-SFW RRS-9-T01N-SFW RRS-9-D01N-SFW RR-3-T01N-SFW	U MB, CCB-I or U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
								RR-3-D01N-SFW RR-3-T01D-SFW RR-3-D01D-SFW	
Vanadium (P) DF = 1	---	---	0.27	0.32	---	0.22	0.28	UNIQUE6-T01N-SFW UNIQUE6-D01N-SFW ERLMID-T01N-SFW ERLMID-D01N-SFW ERLOUT-T01N-SFW ERLOUT-D01N-SFW RRS-12-T01N-SFW RRS-12-D01N-SFW RRS-9-T01N-SFW RRS-9-D01N-SFW RR-3-T01N-SFW RR-3-D01N-SFW RR-3-T01D-SFW RR-3-D01D-SFW	U CCB-I

P = ICP CV = Cold Vapor MB = method Blank CBx-Continuing Calibration Blank
IDL = Instrument Detection Limit DL = Method Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT185S

Sampling Event: Fall 2003 Surface Water

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 12/01/03

Peer Reviewer: Stacey Coker

Date Completed: 12/01/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID[2]	Lab ID[3]	Laboratory Form Field ID Abbreviation[4]	Matrix	Analyses			
						Metals	Inorganics	BOD	COD
RB05T-SFW	RB	543321	A3J090370-001		W	X	X	X	X
RB05D-SFW	RB	543322	A3J090370-002		W	X			
RRS-23-T01N-SFW	SA	543323	A3J090370-003		W	X	X	X	X
RRS-23-D01N-SFW	SA	543324	A3J090370-004		W	X			
RRS-27-T01N-SFW	SA	543325	A3J090370-005		W	X	X	X	X
RRS-27-D01N-SFW	SA	543326	A3J090370-006		W	X			
UFLOUT-T01N-SFW	SA	543327	A3J090370-007		W	X	X	X	X
UFLOUT-D01N-SFW	SA	543328	A3J090370-008		W	X			
ERLIN-T01N-SFW	SA	543329	A3J090370-009		W	X	X	X	X
ERLIN-D01N-SFW	SA	543330	A3J090370-010		W	X			

Matrix: S = Solid W = Water
QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
2 Lab ID used by STL Burlington.
3 Lab ID used by STL North Canton.
4 Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. Included within the STL Burlington case narrative is the table: "Metal Analyses Conducted by STL North Canton". Within this table is the method detection limits (MDL) and North Canton's reporting limits (RL). In keeping with STL Burlington's procedures, and consistent with CLP procedures, the MDL will be used as the RL for the Molycorp RI/FS.

All other issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The metals analyses for the samples in this delivery group were subcontracted to STL's North Canton, OH facility. The coolers were received by North Canton 14 days after samples were collected and at temperatures between 21.2 and 22.0°C. Data qualification was not considered necessary. STL North Canton noted that sample(s) were received or requested after the recommended holding times had expired, were received with insufficient volume, and were received in a broken container. However, all of the requested analyses were conducted within the required holding times and the required reporting limits were attained. As such, the accuracy of this statement is questionable. The reviewer found no evidence of compromised data quality or utility based on COC and sample receipt procedures.
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. Conductivity was measured 10 days after samples were received by lab and pH was measured 4 hours after samples were received by lab. Table 1.1 summarizes the holding times not meeting the acceptance criteria and the resulting qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RB05T-SFW • LD RB05T-SFW	Yes	All MS and LD results were within the evaluation criteria standards. The matrix quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RB05T-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on sample RB05T-SFW was applicable for 0 out of 24 analytes. The serial dilution results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Table 1.3 summarizes the total versus partial results outside the evaluation criteria and the resultant data qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion except RB05T-SFW for which the balance yielded –67.31%. No qualification was necessary due to analytes results being non-detect. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB05T-SFW RB05D-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package did not include any field duplicates, field blanks or trip blanks. The field quality control results for the Fall 2003 SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
RB05T-SFW	---	0.20 UJ	---	---	0.000 J	7.4 J
RRS-23-T01N-SFW	---	0.20 UJ	---	---	146 J	7.5 J
RRS-27-T01N-SFW	---	0.20 UJ	---	---	154 J	6.4 J
UFLOUT-T01N-SFW	---	0.41 J	---	---	222 J	7.2 J
ERLIN-T01N-SFW	1.5 J	0.32 J	0.0050 UJ	0.010 UJ	305 J	7.2 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
Aluminum (P) DF = 1	0.67	0.82	0.91	3.4	0.31	2.9	RRS-23-D01N-SFW RRS-27-T01N-SFW RRS-27-D01N-SFW	U MB-I
Antimony (P) DF = 1	0.32	0.34	0.41	---	0.064	0.11	RRS-23-T01N-SFW RRS-23-D01N-SFW RRS-27-T01N-SFW RRS-27-D01N-SFW UFLOUT-T01N-SFW UFLOUT-D01N-SFW	U CCB-I
Calcium (P) DF = 1	141.0	140.0	146.0	748	42.5	79	RB05T-SFW RB05D-SFW	U MB, CCB-I
Copper (P) DF = 1	-0.026	-0.027	-0.023	0.87	0.017	0.36	RRS-23-T01N-SFW RRS-23-D01N-SFW	U MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	MDL (µg/l)	Samples qualified	Qualification Codes
							RRS-27-T01N-SFW RRS-27-D01N-SFW UFLOUT-D01N-SFW ERLIN-D01N-SFW	
Lead (P) DF = 1	0.0079	0.0082	0.01	0.11	0.0034	0.046	RRS-23-T01N-SFW RRS-27-T01N-SFW	U MB-I
Magnesium (P) DF = 1	50.7	56.9	56.4	124	11.9	36	RB05T-SFW RB05D-SFW	U MB, CCB-I
Potassium (P) DF = 1	210.0	211.0	220.0	203	21.4	35	RB05T-SFW RB05D-SFW	U MB, CCB-I
Vanadium (P) DF = 1	0.35	0.29	0.39	0.34	0.22	0.28	RB05T-SFW RB05D-SFW RRS-23-T01N-SFW RRS-23-D01N-SFW RRS-27-T01N-SFW RRS-27-D01N-SFW UFLOUT-T01N-SFW UFLOUT-D01N-SFW ERLIN-T01N-SFW ERLIN-D01N-SFW	U MB, CCB-I

P = ICP CV = Cold Vapor MB = method Blank CCBx-Continuing Calibration Blank
IDL = Instrument Detection Limit MDL = Method Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Concentration (ug/L)	MDL	Criteria	Qualification Codes
RB05T-SFW	Antimony	ND	0.11	|Diff|>2xRL	UJ TvP-I
RB05D-SFW		2.0			J TvP-I

RL = Reporting Limit RL = Method Detection Limit (MDL) for Metals ND = Non-Detect

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE APRIL 2003 SNOWMELT SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

February 2004

URS

URS Corporation
8181 E. Tufts Avenue
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140349

TABLE OF CONTENTS

Section 1 Introduction 1-1

1.1 Activity Description 1-1
1.2 Summary of April Snowmelt Sample Collection 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Narratives 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Non-Valid Matrix Spikes 3-1
3.2.2 Laboratory Performance Review (LPR) Findings 3-1

Section 4 Collective Summary/Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.2 Laboratory Duplicates (Precision Evaluation) 4-2
4.3 Serial Dilution Results 4-3

Section 5 Collective Summary/Assessment of Field QC Results 5-1

5.1 Field Duplicate Samples 5-1
5.2 Rinsate Blank Results 5-2

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-1
6.4 Representativeness 6-1
6.5 Comparability 6-2
6.6 Sensitivity 6-2

List of Tables

Table 1-1 Total Water Samples Collected During April 2003 Snowmelt Sampling Event

Table 1-2 Field Identification of Surface Water Samples Collected During April 2003 Snowmelt Sampling Event

Table 4-1 Field Samples Submitted for Matrix Spike

Table 4-2 Count of Matrix Spike Samples Collected in April 2003 Snowmelt Sampling Event

Table 4-3 Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Table 4-4 Serial Dilution Outliers and Corresponding Results Qualification for Surface Water Samples

Table 5-1 Surface Water Samples Submitted for Field Duplicate Analyses

Table 5-2 Field Duplicate Collection Frequency for the April 2003 Snowmelt Sampling Event

Table 5-3 Surface Water Field Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Table 5-4 Rinsate Blanks Collected During the April 2003 Snowmelt Sampling Event

Table 5-5 Surface Water Rinsate Blank Detections and Corresponding Result Qualification for Samples Collected During April 2003 Snowmelt Sampling Event

List of Attachments

Attachment 1.1 Data Package WAT094C

Attachment 1.2 Data Package WAT095C

Attachment 1.3 Data Package WAT096C

Attachment 1.4 Data Package WAT097C

Attachment 1.5 Data Package WAT098C

Attachment 1.6 Data Package WAT100C

Attachment 1.7 Data Package WAT101C

Attachment 1.8 Data Package WAT102C

This data validation report is intended to provide the reader with a general overview of the usability of chemical data obtained from April 2003 Snowmelt Sampling Event at the Molycorp Questa Mine, Questa, New Mexico. In addition, this data validation report is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

1.1 ACTIVITY DESCRIPTION

This report contains the results of the data validation conducted for Surface Water samples collected in April Snowmelt of 2003 at the Molycorp Questa Mine, Questa, New Mexico. These water samples were collected in support of the Remedial Investigation/Feasibility Study (RI/FS). The water samples were sent to Severn Trent Laboratories (STL) Burlington in Colchester, VT. The number of samples collected and analyses conducted were in accordance with the Molycorp RI/FS Quality Assurance Project Plan Appendix A-Field Sampling Plan, Automatic Samplers on the Red River-Field Sampling Plan, dated March 14, 2003.

The results were reported in 8 packages. Table 1-1 presents a summary of the number of field and quality control samples collected for each analysis type.

Table 1-1
Total Water Samples Collected during
April 2003 Snowmelt Sampling Event

Sample Type	Total Metals	Dissolved Metals	Selected Inorganics
Surface Water Samples	60	60	60
MS/MSD or MS/LDs	3	3	5
Field Duplicates	3	3	6
Rinsate Blanks	3	3	3
Field Blanks	NA	NA	NA

NA = Not Applicable

The QAPP required that the quality control samples listed above be collected at a frequency of 5%. As illustrated by the table, the frequency of QC analyses was satisfied.

1.2 SUMMARY OF APRIL SNOWMELT SAMPLE COLLECTION

The surface water samples collected during the April Snowmelt 2003 Sampling Event and their associated chemical analyses are summarized in Table 1-2.

Table 1-2
Field Identification of Surface Water Samples
Collected during April 2003 Snowmelt Sampling Event

Sample Identification	Total Metals	Dissolved Metals	Selected Inorganics	Day
ISCO-RR-6-T01N-SFW	x	x	x	1
ISCO-RR-6-T02N-SFW	x	x	x	
ISCO-RR-6-T03N-SFW	x	x	x	
ISCO-RR-6-T04N-SFW	x	x	x	
ISCO-RR-6-T05N-SFW	x	x	x	3
ISCO-RR-6-T06N-SFW	x	x	x	
ISCO-RR-6-T07N-SFW	x	x	x	
ISCO-RR-6-T08N-SFW	x	x	x	
ISCO-RR-6-T09N-SFW	x	x	x	5
ISCO-RR-6-T10N-SFW	x	x	x	
ISCO-RR-6-T11N-SFW	x	x	x	
ISCO-RR-6-T12N-SFW	x	x	x	
ISCO-RR-8-T01N-SFW	x, MS, LD	x	x	1
ISCO-RR-8-T02N-SFW	x	x, MS, LD	x	
ISCO-RR-8-T03N-SFW	x	x	x, MS, LD[1]	
ISCO-RR-8-T04N-SFW	x	x	x, MS, LD[1]	
ISCO-RR-8-T05N-SFW	x, MS, LD	x	x	3
ISCO-RR-8-T06N-SFW	x	x, MS, LD	x	
ISCO-RR-8-T07N-SFW	x	x	x, MS, LD[1]	
ISCO-RR-8-T08N-SFW	x	x	x, MS, LD[1]	
ISCO-RR-8-T09N-SFW	x, MS, LD	x	X	5
ISCO-RR-8-T10N-SFW	x	x, MS, LD	X	
ISCO-RR-8-T11N-SFW	x	x	x, MS, LD[1]	
ISCO-RR-8-T12N-SFW	x	x	x, MS, LD[1]	
ISCO-RR-12-T01N-SFW	x ,FD	x	x	1
ISCO-RR-12-T02N-SFW	x	x, FD	x	
ISCO-RR-12-T03N-SFW	x	x	x, FD	
ISCO-RR-12-T04N-SFW	x	x	x, FD	
ISCO-RR-12-T05N-SFW	x, FD	x	x	3
ISCO-RR-12-T06N-SFW	x	x, FD	x	
ISCO-RR-12-T07N-SFW	x	x	x, FD	
ISCO-RR-12-T08N-SFW	x	x	x, FD	
ISCO-RR-12-T09N-SFW	x, FD	x	x	5
ISCO-RR-12-T10N-SFW	x	x, FD	x	
ISCO-RR-12-T11N-SFW	x	x	x, FD	
ISCO-RR-12-T12N-SFW	x	x	x, FD	
ISCO-RR-15-T01N-SFW	x	x	x	1
ISCO-RR-15-T02N-SFW	x	x	x	
ISCO-RR-15-T03N-SFW	x	x	x	
ISCO-RR-15-T04N-SFW	x	x	x	
ISCO-RR-15-T05N-SFW	x	x	x	3
ISCO-RR-15-T06N-SFW	x	x	x	
ISCO-RR-15-T07N-SFW	x	x	x	
ISCO-RR-15-T08N-SFW	x	x	x	3

Sample Identification	Total Metals	Dissolved Metals	Selected Inorganics	Day
ISCO-RR-15-T09N-SFW	x	x	x	5
ISCO-RR-15-T10N-SFW	x	x	x	
ISCO-RR-15-T11N-SFW	x	x	x	
ISCO-RR-15-T12N-SFW	x	x	x	
ISCO-RR-16-T01N-SFW	x	x	x	1
ISCO-RR-16-T02N-SFW	x	x	x	
ISCO-RR-16-T03N-SFW	x	x	x	
ISCO-RR-16-T04N-SFW	x	x	x	
ISCO-RR-16-T05N-SFW	x	x	x	3
ISCO-RR-16-T06N-SFW	x	x	x	
ISCO-RR-16-T07N-SFW	x	x	x	
ISCO-RR-16-T08N-SFW	x	x	x	
ISCO-RR-16-T09N-SFW	x	x	x	5
ISCO-RR-16-T10N-SFW	x	x	x	
ISCO-RR-16-T11N-SFW	x	x	x	
ISCO-RR-16-T12N-SFW	x	x	x	

SFW = suffix indicating Surface Water sample
FD = Field Duplicate MS = Matrix Spike LD = Laboratory Duplicate

Notes:
For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".
[1] Between the two samples a MS and/or LD, as applicable to the analyte, was done such that QC analyses were done for all analyses.

The snowmelt samples were collected using automated water sample collection devices (i.e., ISCOs). Due to the nature of the sample collection technique, the analyte list was modified/ reduced from the typical RI/FS analysis suite for surface water samples. For this investigation, sample analyses included total metals, dissolved metals, and limited inorganics. Details of the sampling design can be found in the Molycorp RI/FS Quality Assurance Project Plan Appendix A-Field Sampling Plan, Automatic Samplers on the Red River-Field Sampling Plan.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, Inductively Coupled Plasma Spectroscopy (ICP) serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1, and is as follows: If no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used. If no criteria are specified in the SOP or the QAPP then the method-specified acceptance limits were used. If no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

Whenever professional judgement was exercised in evaluating the need for qualification, the basis for the professional judgement is provided in the data review narrative. Section 4 and Attachment 1 provide the data review narratives for each of the data packages.

The site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. The reason for this is that site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Where applicable, the

potential direction of bias (high, low, or indeterminate) has been indicated on the tables in the text, and noted on the sample results sheets as H, L, or I, respectively. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 6.0.

The subsections below cover the data narrative summaries and the general data quality issues that relate to all packages.

3.1 DATA REVIEW NARRATIVES

The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries which are included in Attachment 1. The data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files. The reason codes and bias codes are also stored in the electronic database.

The evaluation of laboratory performance criteria was conducted as described in Section 3.0. The April 2003 Snowmelt Sampling Event Surface Water sample results were reported in eight data packages, including Sample Delivery Groups (SDGs) WAT094 through WAT102, excluding WAT099. All samples were reviewed for the sample-specific criteria described in Section 2.0. Laboratory performance parameters were evaluated on data package WAT098. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters that exceeded acceptance criteria during the laboratory performance criteria review.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several issues were identified which globally affected all relevant water samples analyzed for the April 2003 Snowmelt Sampling Event. Although these issues may have been addressed in the individual data review summary reports, it was considered necessary to summarize them in this data validation report.

3.2.1 Non-Valid Matrix Spikes

There were a total of three scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. First, when native sample concentrations were greater than or equal to four times the spiking concentration, the ability to determine accuracy in the analysis was not accurate as the difference in the spike level with the original analyte concentration was not so discernable due to high concentration levels. In addition, there were several instances in which the reporting limits for various metal analytes were increased due to dilution factors, which affected the reliable quantitation of several spiked metals. In these situations, the reporting limit was greater than the spike concentration added. Related to this scenario, is the last instance in which the difference between the RL concentration and the spike concentration was less than the RL value.

3.2.2 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL data package WAT098 was used to evaluate laboratory performance criteria. No problems were found during the laboratory performance parameter review of data package WAT098, as such, none of the other packages were reviewed for laboratory performance parameters.

The site-specific matrix spike results, method duplicate (MD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three sections present a discussion on the MS analyses, MD analyses, and the serial dilution results for the snowmelt surface water samples collected during the April 2003 Snowmelt Sampling Event sampling event.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Additional aliquots of 11 surface water samples were submitted for use in matrix QC analyses. Table 4-1 below summarizes the site-samples that were used to prepare matrix spike and matrix spike duplicate samples.

Table 4-1
Field Samples Submitted for Matrix Spike

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	
					Modified Inorganics	TSS
ISCO-RR-8-T01N-SFW	Surface water	WAT094	x			
ISCO-RR-8-D02N-SFW	Surface water	WAT094		x		
ISCO-RR-8-T05N-SFW	Surface water	WAT098	x			
ISCO-RR-8-D06N-SFW	Surface water	WAT098		x		
ISCO-RR-8-T09N-SFW	Surface water	WAT100	x			
ISCO-RR-8-D10N-SFW	Surface water	WAT100		x		
ISCO-RR-8-T03N-SFW	Surface water	WAT094			x	
ISCO-RR-8-T04N-SFW	Surface water	WAT094				x
ISCO-RR-8-T07N-SFW	Surface water	WAT098			x	
ISCO-RR-8-T08N-SFW	Surface water	WAT098				x
ISCO-RR-8-T11N-SFW	Surface water	WAT100			x	
ISCO-RR-8-T12-SFW	Surface water	WAT101				x

Notes:
1 For metals and inorganic analyses, a single matrix spike sample was analyzed.
2 For TSS, a laboratory duplicate was analyzed.

The following table lists the surface water matrix spike sample sets:

Table 4-2
Count of Matrix Spike Samples Collected in April 2003 Snowmelt Sampling Event

Analyses	Number of MS samples	Total Samples	Frequency Percentage (%)
SURFACE WATER			
Total Metals	3	60	5
Dissolved Metals	3	60	5
Inorganics	3	60	5

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for analyses.

Although the majority of matrix spike recoveries were within acceptance limits, some were not. Table 4-3 summarizes the spike recoveries that were outside acceptance limits and the subsequent data qualification applied to the affected samples.

Table 4-3
Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Analyte (Control Limits %)	Sample ID	MS %R	Frequency of Limit Exceedance*	Action
METALS				
Total Antimony (Day 1)	ISCO-RR-8-T01N-SFW	70	1 of 3	J/UJ parent sample MS-L only
Total Lead (Day 1)	ISCO-RR-8-T01N-SFW	186	1 of 3	J/UJ parent sample MS-H only
Dissolved Zinc (Day 1)	ISCO-RR-8-D02N-SFW	132	1 of 3	J/UJ parent sample MS-H only
WET CHEMISTRY				
Sulfate (Day 3)	ISCO-RR-8-T07N-SFW	72.4	2 of 6 (both day 3)	J/UJ all samples MS-I
	ISCO-RR-8-T08N-SFW	128.4		

A number of spike recoveries were outside of the QC acceptance limits of 75%-125%. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

Since only one matrix spike was outside evaluation criteria for total antimony, total lead and dissolved zinc professional judgment was used and only the parent samples were qualified as estimated (J/UJ either MS-L or MS-H). Because sulfate was outside evaluation criteria for two out of three matrix spikes, all sulfate results were qualified as estimated (J/UJ MS-I).

4.2 LABORATORY DUPLICATES (PRECISION EVALUATION)

The laboratory duplicate sample analysis results are used to evaluate the precision of the laboratory analyses. An RPD less than 20 percent when both results are more than five times the RL or the absolute difference between results is less than one times the RL when either sample concentration is less than five times the RL was used as the laboratory duplicate evaluation criteria. (Note: For metals, the CLP CRDL was used as the RL for these concentration dependent as the laboratory reported the IDLs as the quantitative RLs and the IDLs are too low for such comparisons to be meaningful.) Additionally, using the CLP CRDL is consistent with Functional Guidelines, which were used as guidance for data review in addition to SOP 12.1.

All laboratory duplicate recoveries were within the laboratory acceptance limits except for those listed in the following table.

Sample ID	Analyte	RPD or Difference	Frequency of Limit Exceedance*	Action
Metals				
ISCO-RR-8-D01N-SFW	Lead	AD = 4 x RL	1 out of 3	J/UJ parent sample only.

Note: The lead CRDL = 2.0 µg/l and the duplicate results were 2.37 µg/l and 16.1 µg/l.

Data qualification was limited to the parent sample only because the laboratory duplicate results for all the other analyses and other samples suggest that the problem was isolated to this sample. Due to the nature of the sample collection technique, a greater degree of inhomogeneity is expected.

4.3 SERIAL DILUTION RESULTS

ICP serial dilutions are analyzed to help evaluate whether or not interferences exist due to sample matrix.

A number of %Ds between the original sample results and the result obtained from a sample diluted 1:5 were >10%. In general, qualification was generally limited to the parent samples if less than a quarter of the valid serial dilution results for a given metal were outside of the acceptance range. Conversely, qualification was generally considered necessary if more than a quarter of the results for a metal were outside the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set, the average %D, and the magnitude of outages were also taken into consideration. The table below summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued.

Table 4-4
Serial Dilution Outliers and Corresponding Results
Qualification for Surface Water Samples

Analyte	Number of Serial Dilutions Samples Analyzed	Number of Valid Results	%Ds >10%	Potential Bias Direction		Action
				Low	High	
Antimony	11	4	1	1	0	J DL-L for parent sample (ISCO-RR-8-T01N-SFW)
Cadmium	11	4	1	1	0	J DL-L for parent sample (ISCO-RR-8-T09N-SFW)
Silver	11	4	2	0	2	J DL-H for parent samples (ISCO-RR-8-T01N-SFW and ISCO-RR-8-D02N-SFW)
Vanadium	11	4	4	0	4	J DL-H for all positive sample results
Zinc	11	6	3	2	1	J DL-I for all sample results

For antimony and cadmium, qualification was limited to the parent samples because only a quarter of the serial dilution results were out. For cadmium, the one exceedance was slight (11.0%) and the average %D was 7.0%. For antimony, the single exceedance was 23.3%, more

than a marginal exceedance, but the other %Ds were quite low 6 to 8% such that the single high %D did not appear to be representative of a trend.

For silver, qualification was also limited to the parent samples although half of the applicable serial dilution results were out. The two exceedances, 14% and 10.9% were considered marginal. Additionally, the average %D of 7.4% was within the acceptance limit.

For vanadium and zinc, however, qualification was extended to the whole data set. For vanadium, all four serial dilution results were out and the average %D was 54.8%. For zinc, two-thirds of the serial dilution results were out, although the average %D of 9.9% was within limits, the exceedances tended to be a bit more than marginal (i.e., 20.6%, 16.9% and 12.9%).

The site-specific duplicate samples, rinsate blanks and field blanks were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrices. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

5.1 FIELD DUPLICATE SAMPLES

The field duplicate sample analysis results may be used to evaluate the overall precision of the analyses (analytical and sampling precision) and/or the sample representativeness. The following concentration dependent evaluation was used. Where both results were greater than or 5 times the Reporting Limit (RL), the Relative Percent Difference (RPD) between the results was compared to a criterion of <25%. If either result was less than 5 times the RL, the absolute difference was compared to a criterion of <1xRL.

Field duplicate samples were collected during this sampling event for metals and inorganics. The tables below summarize the field duplicate samples collected and the frequency of field duplicate collection per analysis type.

Table 5-1
Surface Water Samples Submitted for Field Duplicate Analyses

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	
					Modified Inorganics	TSS
ISCO-RR-12-T01D-SFW	Surface water	WAT095	x			
ISCO-RR-12-T02D-SFW	Surface water	WAT095		x		
ISCO-RR-12-T03D-SFW	Surface water	WAT095			x	
ISCO-RR-12-T04D-SFW	Surface water	WAT096			x	x
ISCO-RR-12-T05D-SFW	Surface water	WAT098	x			
ISCO-RR-12-T06D-SFW	Surface water	WAT098		x		
ISCO-RR-12-T07D-SFW	Surface water	WAT100			x	
ISCO-RR-12-T08D-SFW	Surface water	WAT100			x	x
ISCO-RR-12-T09D-SFW	Surface water	WAT102	x			
ISCO-RR-12-T10D-SFW	Surface water	WAT102		x		
ISCO-RR-12-T11D-SFW	Surface water	WAT102			x	
ISCO-RR-12-T12D-SFW	Surface water	WAT102			x	x

Table 5-2
Field Duplicate Collection Frequency for the April 2003 Snowmelt Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
Total Metals	3	60	5
Dissolved Metals	3	60	5
Inorganics	6	60	10

As shown on the above table, the 5% (or 1 in 20) frequency specification for field duplicates was met for the surface water samples collected in April Snowmelt 2003.

The surface water field duplicate sample results not meeting acceptance criteria and resultant data qualification issued is summarized in the table below:

Table 5-3
Surface Water Field Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Sample ID	Analyte	RPD or Difference	Frequency of Limit Exceedance*	Action
INORGANICS				
All results were within criteria				
METALS				
ISCO-RR-12-T01N-SFW	Sodium	RPD= 78.1%	1 out of 3	J parent sample and field duplicate
ISCO-RR-12-T09N-SFW	Aluminum	AD= >2X RL	1 out of 3	J/UJ parent sample and field duplicate
DISSOLVED METALS				
All results were within criteria				

Qualification was limited to the parent samples although more than a quarter of the field duplicate results were outside acceptance limits for total sodium and total aluminum. A greater degree of inhomogeneity was expected due to the collection technique employed.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. The following rinsate blanks were collected during the April Snowmelt 2003 sampling event:

Table 5-4
Rinsate Blanks Collected During the April 2003 Snowmelt Sampling Event Sampling Event

Sample ID (Date)	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
RB01T-SFW (4/23)	Surface Water	WAT097	x	x	x			
RB02T-SFW (4/23)	Surface Water	WAT097	x	x	x			
RB03T-SFW (4/24)	Surface Water	WAT102	x	x	x			

The QAPP required frequency of 5% for the collection of rinsate blanks was met for the April 2003 Snowmelt Sampling Event water sampling event.

While any potential metals contribution to the rinsate blanks from contaminated sampling equipment would be captured in the total metals analyses, the rinsate blanks were analyzed for dissolved metals as well. The samples for dissolved metals analysis were filtered using factory-sealed, dedicated, and disposable in-line filter cartridges. Therefore, positive dissolved metals

results would reflect a fraction of the total metals concentrations in the associated rinsate blank or potential metals contribution from the filter media.

The following surface water rinsate blank results and their effects regarding surface water results qualification are provided in the following table:

Table 5-5
Surface Water Rinsate Blank Detections and Corresponding Result Qualification for Samples Collected during April 2003 Snowmelt Sampling Event

Analyte	Sample ID	Detected Conc.	Comment	Sample Result Range	Action
METALS (µg/L)					
All results were nondetect					
INORGANICS					
TDS	RB01T-SFW	28	3 out of 3	132-154 mg/L	None. All sample concentrations were greater than the qualification threshold (≤ 132 mg/l).
	RB02T-SFW	22			
	RB03T-SFW	28			

The analytes for the surface water rinsate blank samples were detected in more than a quarter of the rinsate blank samples collected. However, it was determined that the snowmelt rinsate blank concentrations were insignificant in relation to the average sample concentrations for the associated analytes indicating acceptable decontamination procedures. Therefore, no qualifications of data were necessary.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank contamination. In addition, some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summaries. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

Of 186 lab duplicate results, all satisfied the applicable evaluation criteria, for a total of 100 %. Of 180 field duplicate results, 178 satisfied the applicable evaluation criteria, for a total of 99 %. As such, the overall level of precision demonstrated is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of Laboratory Control Samples (LCSs) and MSs.

All of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP. This indicates acceptable overall accuracy with respect to the analytical system.

Ninety-nine percent of the MS recoveries (173 valid of 175 recoveries) satisfied the applicable evaluation criteria for accuracy specified in the QAPP, indicating that acceptable overall accuracy was attained with respect to the site matrix.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements in relation to the number of measurements requested.

There were 60 surface water samples collected during the April Snowmelt 2003 sampling event. All samples yielded valid results for all target analytes, consequently the completeness achieved was 100%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting Field Sampling Plan FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the Surface Water samples. The close agreement between the field duplicate results, as discussed above in Section 6.1, indicates that the samples collected were adequately representative of the medium sampled.

Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. Again, the close agreement between duplicates noted in Section 6.1 indicates that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable Samples when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. Therefore, it is anticipated that all data will be usable in the risk assessment.

Attachments

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT094C

Sampling Event: April 2003 Snowmelt (Day 1)

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 07/28/03

Peer Reviewer: Stacey Coker

Date Completed: 07/30/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses			
				Metals	Organic	pH	Conductivity
ISCO-RR-6-T01N-SFW	SA	52437	W	X	X	X	X
ISCO-RR-6-D01N-SFW	SA	52438	W	X			
ISCO-RR-6-T02N-SFW	SA	52439	W	X	X	X	X
ISCO-RR-6-D02N-SFW	SA	52440	W	X			
ISCO-RR-6-T03N-SFW	SA	52441	W	X	X	X	X
ISCO-RR-6-D03N-SFW	SA	52442	W	X			
ISCO-RR-6-T04N-SFW	SA	52443	W	X	X	X	X
ISCO-RR-6-D04N-SFW	SA	52444	W	X			
ISCO-RR-8-T01N-SFW	SA	52445	W	X	X	X	X
ISCO-RR-8-D01N-SFW	SA	52446	W	X			
ISCO-RR-8-T02N-SFW	SA	52447	W	X	X	X	X
ISCO-RR-8-D02N-SFW	SA	52448	W	X			
ISCO-RR-8-T03N-SFW	SA	52449	W	X	X	X	X
ISCO-RR-8-D03N-SFW	SA	52450	W	X			
ISCO-RR-8-T04N-SFW	SA	52451	W	X	X	X	X
ISCO-RR-8-D04N-SFW	SA	52452	W	X			
ISCO-RR-15-T01N-SFW	SA	52453	W	X	X	X	X
ISCO-RR-15-D01N-SFW	SA	52454	W	X			
ISCO-RR-15-T02N-SFW	SA	52455	W	X	X	X	X
ISCO-RR-15-D02N-SFW	SA	52456	W	X			

Matrix: W = Water
QC Type: SA = Sample
[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory noted sample identifiers were abbreviated, in certain instances, to accommodate field length limitations in the data processing. Upon review of the sample ids, it was verified that all were complete and the comment by the laboratory was incorrect.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	No problems were noted.
Holding Times	No	The 48-hour holding times for nitrate, nitrite and orthophosphate were exceeded by several hours for the samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for samples were taken 18 after sampling, and 16 days beyond log-in. The pH for all samples was measured approximately six hours after log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value.
Matrix QC • MS/MSD ISCO-RR-8-T01N-SFWMS ISCO-RR-8-D02N-SFWMS ISCO-RR-8-T03N-SFWMS ISCO-RR-8-T04N-SFWMS • PDS ISCO-RR-8-T01N-SFWA ISCO-RR-8-D02N-SFWA ISCO-RR-8-T03N-SFWA ISCO-RR-8-T04N-SFWA • LD ISCO-RR-8-T01N-SFWD ISCO-RR-8-D02N-SFWD ISCO-RR-8-T03N-SFWD ISCO-RR-8-T04N-SFWD	No	The metals analyses of samples ISCO-RR-8-T01N-SFW and ISCO-RR-8-D02N-SFW resulted in the recovery of several matrix analytes outside of the acceptance range of 75-125%. Table 1.3 summarizes these analytes along with the associated percent recoveries and the qualification codes assigned to the parent samples. The laboratory duplicate analysis resulted in the qualification of lead in the parent sample (ISCO-RR-8-T01N-SFW) as estimated (J). Sample ISCO-RR-8-T01N-SFW reported a concentration of 2.37 µg/L and its duplicate (ISCO-RR-8-T01N-SFWD) reported a lead concentration of 16.3 µg/L. The CRDL (run at a straight analysis for lead) established a control limit of 2.0 µg/L. Due to the fact that the lead in the original sample was not greater than 5 x 2.0 µg/L, the absolute difference between the two results (13.9 µg/L) was compared to an evaluation criterion of ≤1xCRDL (i.e., ≤2.0 µg/L). Accordingly, lead in the parent sample was qualified as estimated with an indeterminate direction of bias. The matrix quality control results for the April 2003 Snowmelt sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) • ISCO-RR-8-D02N-SFWSL • ISCO-RR-8-T01N-SFWSL • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses on samples ISCO-RR-8-D02N-SFW and ISCO-RR-8-T01N-SFW were applicable for 18 of the 24 metal analytes, as only six metal analytes (Ca, Fe, Mg, Se, K and Na) did not report initial sample results which were sufficiently larger (x50) than the IDL, (adjusted for dilution). Of the 18 metal analytes, three (in each dilution) exhibited percent deviations in excess of 10%, thereby not satisfying the ≤10% deviation between the original sample and its 5-fold dilution criterion. Accordingly, several results for the metals summarized in the Table 1.4 were qualified as estimated (J/UJ) in the parent sample with varying directions of bias. Snowmelt samples were collected using ISCO automated water sampling devices. The analyses conducted on snowmelt samples were reduced relative to analyses specified for surface water samples in the Field Sampling plan because of the limited volume available due to nature of the sample collection technique and sampling design. While all bottles/analyses specified in the Automated Samplers on the Red River- Field Sampling Plan (dated 03/14/03) were collected and analyzed, the cation/anion balance calculation could not be done due to the reduced list of inorganic analytes. In addition, the ratios of the calculated versus measured TDS could not be determined due to the reduced analyte list.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank • Field Blank Trip Blank	N/A	No field QC samples were analyzed with this package. The field QC results for the April 2003 Snowmelt sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Conductivity	pH
ISCO-RR-6-T01N-SFW	0.49 J	0.0050 UJ	2.0 J	6.9 J
ISCO-RR-6-T02N-SFW	0.49 J	0.0050 UJ	223 J	7.2 J
ISCO-RR-6-T03N-SFW	0.49 J	0.0050 UJ	223 J	7.4 J
ISCO-RR-6-T04N-SFW	0.50 J	0.0050 UJ	225 J	7.6 J
ISCO-RR-8-T01N-SFW	0.49 J	0.0050 UJ	225 J	7.7 J
ISCO-RR-8-T02N-SFW	0.48 J	0.0050 UJ	229 J	7.7 J
ISCO-RR-8-T03N-SFW	0.51 J	0.0050 UJ	229 J	7.8 J
ISCO-RR-8-T04N-SFW	0.49 J	0.0050 UJ	235 J	7.9 J
ISCO-RR-15-T01N-SFW	0.50 J	0.0050 UJ	268 J	7.7 J
ISCO-RR-15-T02N-SFW	0.48 J	0.0050 UJ	270 J	7.7 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminium (P)	61.0	---	---	64.4	78.8	---	50.3	ISCO-RR-15-D01N-SFW ISCO-RR-15-D02N-SFW ISCO-RR-6-D01N-SFW ISCO-RR-6-D02N-SFW ISCO-RR-6-D03N-SFW ISCO-RR-6-D04N-SFW ISCO-RR-8-D03N-SFW ISCO-RR-8-D04N-SFW	U CCB-I
Antimony (MS)	0.9/1.1	0.9/1.0	0.9/1.1	0.9/1.1	1.0	---	0.30	ISCO-RR-15-D01N-SFW ISCO-RR-6-T01N-SFW ISCO-RR-8-D01N-SFW ISCO-RR-8-T01N-SFW ISCO-RR-8-T03N-SFW	U CCB-I
Copper (P)	---	-1.7	---	---	-2.6	---	1.5	ISCO-RR-6-D01N-SFW ISCO-RR-6-D02N-SFW ISCO-RR-6-D03N-SFW ISCO-RR-6-D04N-SFW ISCO-RR-8-D01N-SFW ISCO-RR-8-D02N-SFW	J CCB-L
Lead (MS)	---	---	---	---	---	0.199	0.10	ISCO-RR-15-D01N-SFW ISCO-RR-15-D02N-SFW ISCO-RR-6-D01N-SFW ISCO-RR-6-D02N-SFW ISCO-RR-6-D03N-SFW ISCO-RR-6-D04N-SFW ISCO-RR-8-D01N-SFW ISCO-RR-8-D02N-SFW ISCO-RR-8-D03N-SFW ISCO-RR-8-D04N-SFW	U MB-I
Nickel (P)	---	---	26.5	22.5	21.6	---	3.0	ISCO-RR-15-D01N-SFW ISCO-RR-15-D02N-SFW ISCO-RR-15-T01N-SFW ISCO-RR-15-T02N-SFW ISCO-RR-8-D01N-SFW ISCO-RR-8-D02N-SFW ISCO-RR-8-D03N-SFW ISCO-RR-8-D04N-SFW ISCO-RR-8-T01N-SFW ISCO-RR-8-T02N-SFW ISCO-RR-8-T03N-SFW ISCO-RR-8-T04N-SFW	U CCB-I
Potassium (P)	441.6	435.2	---	464.7	---	---	325.5	All samples with the **exception of:** ISCO-RR-6-T01N-SFW	U CCB-I
Zinc (P)						2.063	1.4	All samples	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results And Parent Sample Qualifications

Analyte	% MS	PDS %R	Criteria	RL* (µg/L)	Comment	Action
ISCO-RR-8-T01N-SFW (C)						
Antimony	69.9	91.9	75-125%	0.30	Potential low bias	0.03 UJ MS-L
Lead	185.7	103.8		0.10	Potential high bias	2.4 J MS-H
ISCO-RR-8-D02N-SFW (C)						
Zinc	132.0	99.7	75-125%	1.4	Potential high bias	Nondetect ∴ No Qualification

Table 1.4
Serial Dilution Results and Qualifications

Analyte	Serial Dilution % Difference	Qualification Code
ISCO-RR-8-T01N-SFW		
Antimony	23.3	UJ DL-L
Silver	14.0	UJ DL-L
Vanadium	69.3	J DL-H
ISCO-RR-8-D02N-SFW		
Silver	10.9	Nondetect results; therefore, qualification not necessary as implied bias direction is high.
Vanadium	67.5	
Zinc	20.6	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT095C

Sampling Event: April 2003 Snowmelt (Day 1)

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

LP Reviewer: Brian Olmsted

Date Completed: 01/30/04

Data Reviewer: Karen Kronoveter

Date Completed: 07/31/03

Peer Reviewer: Stacey Coker

Date Completed: 08/06/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses			
				Metals	Organic	pH	uct
ISCO-RR-15-T03N-SFW	SA	524310	W	X	X	X	X
ISCO-RR-15-D03N-SFW	SA	524311	W	X			
ISCO-RR-15-T04N-SFW	SA	524312	W	X	X	X	X
ISCO-RR-15-D04N-SFW	SA	524313	W	X			
ISCO-LR-16-T01N-SFW	SA	524314	W	X	X	X	X
ISCO-LR-16-D01N-SFW	SA	524315	W	X			
ISCO-LR-16-T02N-SFW	SA	524316	W	X	X	X	X
ISCO-LR-16-D02N-SFW	SA	524317	W	X			
ISCO-LR-16-T03N-SFW	SA	524318	W	X	X	X	X
ISCO-LR-16-D03N-SFW	SA	524319	W	X			
ISCO-LR-16-T04N-SFW	SA	524320	W	X	X	X	X
ISCO-LR-16-D04N-SFW	SA	524321	W	X			
ISCO-RR-12-T01N-SFW	SA	524322	W	X	X	X	X
ISCO-RR-12-D01N-SFW	SA	524323	W	X			
ISCO-RR-12-T01D-SFW	FD	524324	W	X			
ISCO-RR-12-T02N-SFW	SA	524325	W	X	X	X	X
ISCO-RR-12-D02N-SFW	SA	524326	W	X			
ISCO-RR-12-D02D-SFW	FD	524327	W	X			
ISC0-RR-12-T03N-SFW	SA	524328	W	X	X	X	X
ISC0-RR-12-D03N-SFW	SA	524329	W	X			
ISCO-RR-12-T03D-SFW	FD	524330	W		X[2]		

Matrix: W = Water
QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2]Field duplicate for modified inorganics only.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the laboratory case narrative are addressed in the relevant sections in the table.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory log-in sheet noted sample ISCO-RR-12-T01D-SFW was marked on the COC for inorganic suite in addition to metals, but the volume received was in a HNO_3^- preserved poly bottle, as required for metals analyses. Consequently, this sample was analyzed for metals. The only inorganics parameter reported for this field duplicate sample was hardness, which is calculated from the sum of the calcium and magnesium results. In addition, sample ISCO-RR-12-T03D-SFW was marked on the COC for metals in addition to the inorganic suite. However, no HNO_3^- preserved volumes were received. Accordingly, the sample was only analyzed for the inorganic suite. According to the Automated Samples on the Red River- Field Sampling Plan, the analyses conducted on these two samples were correct and that the COC was erroneous. No qualification of data was necessary on the basis of COC or sample receipt.
Holding Times	No	The 48-hour holding times for nitrate, nitrite, and orthophosphate were exceeded by several hours for the majority of the samples in this data package. Accordingly, analyses conducted outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for samples were taken 18 after sampling, and 16 days beyond log-in. The pH for all samples was measured approximately five hours after log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 Snowmelt sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Internal Standards • Surrogates • Serial Dilution (C) ISCO-RR-15-T03N-SFWL • Total vs. Partial Analyses • Cation/Anion Balance	No	The internal standard ^6Li recoveries were low for the ICPMS analysis of samples ISCO-RR-15-T04N-SFW, ISCO-RR-15-D04N-SFW, and ISCO-LR-16-T01N-SFW. Therefore, potassium results for these samples, as verified by the run logs, were reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution analysis on sample ISCO-RR-15-T03N-SFW was not applicable for all 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL, (adjusted for dilution). It was therefore not necessary to qualify any results on the basis of serial dilutions. Snowmelt samples were collected using ISCO automated water sampling devices. The analyses conducted on snowmelt samples were reduced relative to analyses specified for surface water samples in the Field Sampling Plan because of the limited volume available due to nature of the sample collection technique and sampling design. While all bottles/analyses specified in the Automated Samplers on the Red River- Field Sampling Plan (dated 03/14/03) were collected and analyzed, the cation/anion balance calculation could not be done due to the reduced list of inorganic analytes. In addition, the ratios of the calculated versus measured TDS could not be determined due to the reduced analyte list.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate ISCO-RR-12-T01N/T01D-SFW ISCO-RR-12-D02N/D02D-SFW ISCO-RR-12-T03N/T03D-SFW • Rinsate Blank • Field Blank • Trip Blank	No	The nickel concentration of 123 µg/L in sample ISCO-RR-12-D02N-SFW does not agree with the nickel concentration of 11.3 µg/L in its field duplicate sample ISCO-RR-12-D02D-SFW. Because both sample results were not greater than 5x the CRDL (40 ug/l for a straight analysis), the absolute difference between the two results was compared to an evaluation criterion of <2x the CRDL. Accordingly, both nickel results were qualified as estimated (J) with an indeterminate direction of bias and a qualifier code of "FD". The field QC results for the April 2003 Snowmelt sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	N/A	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Conductivity	pH
ISCO-RR-15-T03N-SFW	0.47 J	0.0050 UJ	268 J	7.3 J
ISCO-RR-15-T04N-SFW	0.47 J	0.0050 UJ	271 J	7.4 J
ISCO-LR-16-T01N-SFW	0.43 J	---	323 J	7.8 J
ISCO-LR-16-T02N-SFW	0.44 J	---	316 J	7.8 J
ISCO-LR-16-T01N-SFW	0.51 J	---	315 J	7.9 J
ISCO-LR-16-T04N-SFW	0.46 J	---	318 J	8.0 J
ISCO-RR-12-T01N-SFW	0.49 J	0.0050 UJ	262 J	7.9 J
ISCO-RR-12-T02N-SFW	0.49 J	0.0050 UJ	260 J	7.7 J
ISCO-RR-12-T03N-SFW	0.50 J	0.0050 UJ	266 J	7.7 J
ISCO-RR-12-T03D-SFW	0.49 J	0.0050 UJ	263 J	7.7 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminium (P)	---	-76.8	---	84.8	---	-101.100	50.3	ISCO-LR-16-D01N-SFW ISCO-LR-16-D02N-SFW ISCO-LR-16-D03N-SFW ISCO-LR-16-D04N-SFW ISCO-RR-12-D01N-SFW ISCO-RR-12-D02D-SFW ISCO-RR-12-D02N-SFW ISCO-RR-12-D03N-SFW ISCO-RR-15-D03N-SFW ISCO-RR-15-D04N-SFW	UJ MB,CCB-L or U CCB-I or UJ JMB-L
Beryllium (P)	-0.4	---	---	---	---	---	0.30	ISCO-LR-16-D01N-SFW ISCO-LR-16-T01N-SFW ISCO-RR-15-D04N-SFW ISCO-RR-15-T03N-SFW ISCO-RR-15-D03N-SFW ISCO-RR-15-T04N-SFW	UJ CCB-L or J CCB-L
Cadmium (P)	---	---	---	---	---	-0.560	0.50	All samples were qualified	UJ MB-L
Iron (P)	31.5	---	40.6	85.1	---	---	31.1	ISCO-LR-16-D04N-SFW ISCO-LR-16-T01N-SFW ISCO-LR-16-T02N-SFW ISCO-LR-16-T03N-SFW ISCO-LR-16-T04N-SFW ISCO-RR-12-T01D-SFW ISCO-RR-12-T01N-SFW ISCO-RR-12-T02N-SFW ISCO-RR-12-T03N-SFW ISCO-RR-15-T03N-SFW ISCO-RR-15-T04N-SFW	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Potassium (P)	---	---	---	505.9	---	---	325.5	ISCO-RR-12-D02D-SFW ISCO-RR-12-D02N-SFW ISCO-RR-12-D03N-SFW ISCO-RR-12-T03N-SFW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT096C

Sampling Event: April 2003 Snowmelt (Day 1)

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 07/28/03

Peer Reviewer: Stacey Coker

Date Completed: 07/28/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
ISCO-RR-12-T04N-SFW	SA	524364		W	X	X
ISCO-RR-12-D04N-SFW	SA	524365		W	X	
ISCO-RR-12-T04D-SFW	FD	524366		W		X[3]

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.
[3] TSS only in accordance with ISCO Bottle Filling Logistics table.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The COC for sample ISCO-RR-12-T04D-SFW indicated that metals and modified inorganic suite were supposed to be analyzed. However, only a W-8 bottle for the TSS analysis was sent, which is in agreement with the ISCO Bottle Filling Logistics table. As such, the metals box on the COC was erroneously checked.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Holding Times	No	The analysis for pH and conductivity were exceeded by 2 and 18 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, lead, manganese, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 Snowmelt sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution ISCO-RR-12-T04N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample ISCO-RR-12-T04N-SFW (pH class C). The test was applicable for only 1of the 24 analytes. Snowmelt samples were collected using ISCO automated water sampling devices. The analyses conducted on snowmelt samples were reduced relative to analyses specified for surface water samples in the Field Sampling plan because of the limited volume available due to nature of the sample collection technique and sampling design. While all bottles/analyses specified in the Automated Samplers on the Red River- Field Sampling Plan (dated 03/14/03) were collected and analyzed, the cation/anion balance calculation could not be done due to the reduced list of inorganic analytes. In addition, the ratios of the calculated versus measured TDS could not be determined due to the reduced analyte list.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any site-specific field quality control samples. The field quality control results for the April 2003 Snowmelt sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the laboratory performance reviews, the following additional parameters were evaluated: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH
ISCO-RR-12-T04N-SFW	8890 J	3.6 J

Table 1.2
Method Blank Detections Resulting in Data Qualification

Analyte	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminium (P) DF=1	83.8	75.6		50.3	ISCO-RR-12-D04N-SFW	U CCB-I
Antimony (MS) DF=1	0.7	1.0		0.3	ISCO-RR-12-T04N-SFW	U CCB-I
Lead (MS) DF=1			-0.3	0.1	All samples in this package	UJ/J MB-L
Manganese (P) DF=10	8.4	2.3	6.4	1.0	All samples in this package	U CCB,MB-I

MS=ICP- MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT097C

Sampling Event: April 2003 Snowmelt (Day 3)

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 08/04/03

Peer Reviewer: Stacey Coker

Date Completed: 08/07/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses			
				Metals	Inorganics	pH	Conductivity
ISCO-LR-16-T05N-SFW	SA	524606	W	X	X	X	X
ISCO-LR-16-D05N-SFW	SA	524607	W	X			
ISCO-LR-16-T06N-SFW	SA	524608	W	X	X	X	X
ISCO-LR-16-D06N-SFW	SA	524609	W	X			
ISCO-LR-16-T07N-SFW	SA	524610	W	X	X	X	X
ISCO-LR-16-D07N-SFW	SA	524611	W	X			
ISCO-RR-6-T05N-SFW	SA	524612	W	X	X	X	X
ISCO-RR-6-D05N-SFW	SA	524613	W	X			
ISCO-RR-6-T06N-SFW	SA	524614	W	X	X	X	X
ISCO-RR-6-D06N-SFW	SA	524615	W	X			
ISCO-RR-6-T07N-SFW	SA	524616	W	X	X	X	X
ISCO-RR-6-D07N-SFW	SA	524617	W	X			
ISCO-RR-15-T06N-SFW	SA	524618	W	X	X	X	X
ISCO-RR-15-D06N-SFW	SA	524619	W	X			
ISCO-RR-15-T07N-SFW	SA	524620	W	X	X	X	X
ISCO-RR-15-D07N-SFW	SA	524621	W	X			
ISCO-RR-15-T08N-SFW	SA	524622	W	X	X	X	X
ISCO-RR-15-D08N-SFW	SA	524623	W	X			
RB01T-SFW	RB	524624	W	X	X	X	X
RB02T-SFW	RB	524625	W	X	X	X	X

Matrix: W = Water
QC Type: SA = Sample RB = Rinsate Blank
[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the laboratory case narrative are addressed in the relevant sections in the table.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory log-in sheet noted that samples RB01T-SFW and RB02T-SFW were not marked on the COC for pH and conductivity, but were analyzed for these parameters due to adequate volumes received. No qualification of data was necessary on the basis of COC or sample receipt.
Holding Times	No	The 48-hour holding times for nitrate and nitrite were exceeded by several hours for the majority of samples in this data package. Accordingly, analyses conducted outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for samples were taken 16 after sampling, and 14 days beyond log-in. The pH for all samples was measured approximately five hours after log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 Snowmelt sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) • ISCO-LR-16-T05N-SFWSL • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample ISCO-LR-16-T05N-SFW was not applicable any of the 24 metal analytes, as none of the metal analytes reported initial sample results sufficiently larger (x50) than the IDL, (adjusted for dilution). No qualification of data on the basis of serial dilution was considered necessary. Snowmelt samples were collected using ISCO automated water sampling devices. The analyses conducted on snowmelt samples were reduced relative to analyses specified for surface water samples in the Field Sampling plan because of the limited volume available due to nature of the sample collection technique and sampling design. While all bottles/analyses specified in the Automated Samplers on the Red River- Field Sampling Plan (dated 03/14/03) were collected and analyzed, the cation/anion balance calculation could not be done due to the reduced list of inorganic analytes. In addition, the ratios of the calculated versus measured TDS could not be determined due to the reduced analyte list.
Field QC • Field Duplicate • Rinsate Blank • RB01T-SFW • RB02T-SFW • Field Blank • Trip Blank	Yes	The rinsate blank results associated and analyzed with the data in this package (RB01T-SFW and RB 02T-SFW) were nondetect for all analytes with the exception of total dissolved solids (28.0 mg/L and 22.0 mg/L, respectively). The field QC results for the April 2003 Snowmelt sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Conductivity	pH
ISCO-LR-16-T05N-SFW	0.40 UJ	0.0050 UJ	308 J	8.0 J
ISCO-LR-16-T06N-SFW	0.40 UJ	---	316 J	8.1 J
ISCO-LR-16-T07N-SFW	0.40 UJ	---	319 J	7.8 J
ISCO-RR-6-T05N-SFW	0.40 UJ	0.0050 UJ	223 J	7.7 J
ISCO-RR-6-T06N-SFW	0.40 UJ	0.0050 UJ	227 J	7.6 J
ISCO-RR-6-T07N-SFW	0.40 UJ	0.0050 UJ	224 J	7.7 J
ISCO-RR-15-T06N-SFW	0.40 UJ	0.0050 UJ	261 J	7.7 J
ISCO-RR-15-T07N-SGW	0.40 UJ	0.0050 UJ	263 J	7.7 J
ISCO-RR-15-T08N-SFW	0.40 UJ	0.0050 UJ	268 J	7.7 J
RB01T-SFW	0.40 UJ	0.0050 UJ	0.00 J	7.5 J
RB02T-SFW	0.40 UJ	0.0050 UJ	0.60 J	5.8 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	1.2	1.1	1.3	1.3	---	0.830	0.30	ISCO-LR-16-D05N-SFW ISCO-LR-16-T05N-SFW ISCO-RR-15-T08N-SFW ISCO-RR-6-T05N-SFW	U MB,CCB-I
Beryllium (P)	-0.6	-0.4	-0.6	-0.4	---	-0.725	0.30	All samples	UJ MB,CCB-L
Iron (P)	35.5	75.6	44.9	49.2	42.8	36.530	31.1	ISCO-LR-16-T05N-SFW ISCO-LR-16-T06N-SFW ISCO-LR-16-T07N-SFW ISCO-RR-15-T06N-SFW ISCO-RR-15-T07N-SFW ISCO-RR-15-T08N-SFW ISCO-RR-6-T05N-SFW ISCO-RR-6-T06N-SFW ISCO-RR-6-T07N-SFW	U MB,CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Lead (MS)	---	---	---	---	---	0.256	0.10	All samples with the **exception of:** ISCO-LR-16-T05N-SFW ISCO-RR-15-D08N-SFW	U MB-I
Nickel (P)	4.7	3.8	4.5	4.1	---	---	3.0	ISCO-LR-16-D05N-SFW ISCO-LR-16-D06N-SFW ISCO-LR-16-D07N-SFW ISCO-LR-16-T05N-SFW ISCO-LR-16-T06N-SFW ISCO-LR-16-T07N-SFW	U CCB-I
Potassium (P)	366.0	---	466.1	---	---	492.600	325.5	All samples with the **exception of**: RB01T-SFW	U MB,CCB-I
Sodium (P)	---	558.4	---	---	---	---	352.0	All samples with the **exception of:** ISCO-RR-15-D08N-SFW ISCO-RR-15-T08N-SFW RB01T-SFW RB02T-SFW	U CCB-I
Zinc (P)	---	1.7	---	---	---	3.563	1.4	All samples with the **exception of**: RB01T-SFW RB02T-SFW	U MB,CCB-I or U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit
IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT098C

Sampling Event: April 2003 Snowmelt (Day 3)

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter

Date Completed: 07/29/03

Peer Reviewer: Stacey Coker

Date Completed: 07/31/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses			
				Metals	Inorganics	pH	Conductivity
ISCO-RR-12-T05N-SFW	SA	524647	W	X	X	X	X
ISCO-RR-12-D05N-SFW	SA	524648	W	X			
ISCO-RR-12-T05D-SFW	FD	524649	W	X			
ISCO-RR-12-T06N-SFW	SA	524650	W	X	X	X	X
ISCO-RR-12-D06N-SFW	SA	524651	W	X			
ISCO-RR-12-D06D-SFW	FD	524652	W	X			
ISCO-LR-16-T08N-SFW	SA	524653	W	X	X	X	X
ISCO-LR-16-D08N-SFW	SA	524654	W	X			
ISCO-RR-8-T07N-SFW	SA	524655	W	X	X	X	X
ISCO-RR-8-D07N-SFW	SA	524656	W	X			
ISCO-RR-8-T08N-SFW	SA	524657	W	X	X	X	X
ISCO-RR-8-D08N-SFW	SA	524658	W	X			
ISCO-RR-15-T05N-SFW	SA	524659	W	X	X	X	X
ISCO-RR-15-D05N-SFW	SA	524660	W	X			
ISCO-RR-6-T08N-SFW	SA	524661	W	X	X	X	X
ISCO-RR-6-D08N-SFW	SA	524662	W	X			
ISCO-RR-8-T05N-SFW	SA	524663	W	X	X	X	X
ISCO-RR-8-D05N-SFW	SA	524664	W	X			
ISC0-RR-8-T06N-SFW	SA	524665	W	X	X	X	X
ISC0-RR-8-D06N-SFW	SA	524666	W	X			

Matrix: W = Water
QC Type: SA = Sample
[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the laboratory case narrative are addressed in the relevant sections in the table.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory log-in sheet noted that insufficient volume had been received for samples ISCO-RR-8-T07N-SFW and ISCO-RR-8-T08N-SFW for the QC analyses of TSS. As such, a duplicate analysis for TSS could not be conducted. Both samples reported TSS concentrations. In addition, sample ISCO-RR-12-T05D-SFW was marked on the COC for metals and inorganic suite but only a HNO_3^- preserved poly bottle was received (as required for metals analyses). According to the bottle filling logistics table included in the Automated Water Samplers on the Red River- Field Sampling Plan (FSP), at this sampling location and time only a field duplicate for the metals analysis was supposed to be collected. As such, the bottles submitted were in accordance with the FSP and the request for inorganics for this sample on the COC was in error. No qualification of data was necessary on the basis of COC or sample receipt.
Holding Times	No	As noted in the laboratory case narrative, all nitrate analyses were run one day beyond the prescribed analytical holding time of 48 hours due to a malfunction of the IC instrument autosampler device. Accordingly, nitrate results for all samples in this package were qualified as estimated (J/UJ) with an indeterminate direction of bias. The 48-hour holding times for nitrite were exceeded by several hours for the majority of samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for samples were taken 16 after sampling, and 14 days beyond log-in. The pH for all samples was measured approximately six hours after log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value.
Matrix QC • MS/MSD ISCO-RR-8-T07N-SFWMS ISCO-RR-8-T08N-SFWMS ISCO-RR-8-T05N-SFWMS ISCO-RR-8-D06N-SFWMS • PDS ISCO-RR-8-T07N-SFWA ISCO-RR-8-T08N-SFWA ISCO-RR-8-T05N-SFWA ISCO-RR-8-D06N-SFWA • LD ISCO-RR-8-T07N-SFWREP ISCO-RR-8-T08N-SFWREP ISCO-RR-8-T05N-SFWREP ISCO-RR-8-D06N-SFWREP	No	The sulfate matrix spike in sample ISCO-RR-T07N-SFW was recovered at 72.4%, slightly below the established control limit of 75-125%, thereby suggesting a potential low bias. As a result, the sulfate result for this sample of 57.8 mg/L was qualified as estimated (J) with a low bias for this parent sample. The sulfate matrix spike for sample ISCO-RR-8-T08N-SFW yielded a percent recovery of 128.4%, slightly above the high end of the acceptance range. Accordingly, the sulfate result for this sample of 57.8 mg/L was qualified as estimated with a high potential bias for the parent sample. The matrix quality control results for the April 2003 Snowmelt sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (C) ISCO-RR-8-T05N-SFWSL ISCO-RR-8-D06N-SFWL • Total vs. Partial Analyses • Cation/Anion Balance	No	Serial dilutions were analyzed for two samples in this package. The serial dilution analyses for the ICP-MS reported metal analytes run on samples ISCO-RR-T05N-SFW and ISCO-RR-D06N-SFW were not applicable to all eight of the eight analytes tested. The serial dilution analyses on the same two samples for the ICP reported metals were not applicable to 13 of 16 metal analytes, as only magnesium, potassium, and sodium reported initial sample results which were sufficiently larger (x50) than the IDL, (adjusted for dilution). All three metals exhibited percent differences less than 10%, thereby satisfying the ≤10% difference between the original sample and its 5-fold dilution criterion. It was therefore unnecessary to qualify any data on the basis of serial dilution. Snowmelt samples were collected using ISCO automated water sampling devices. The analyses conducted on snowmelt samples were reduced relative to analyses specified for surface water samples in the Field Sampling plan because of the limited volume available due to nature of the sample collection technique and sampling design. While all bottles/analyses specified in the Automated Samplers on the Red River- Field Sampling Plan (dated 03/14/03) were collected and analyzed, the cation/anion balance calculation could not be done due to the reduced list of inorganic analytes. In addition, the ratios of the calculated versus measured TDS could not be determined due to the reduced analyte list. The copper results for samples ISCO-RR-6-D08N-SFW and ISCO-RR-6-T08N-SFW were qualified as estimated (J/UJ TVP-I) because the dissolved copper result was greater than the total copper result.
Field QC • Field Duplicate ISCO-RR-12-T05D-SFW ISCO-RR-12-D06D-SFW • Rinsate Blank • Field Blank • Trip Blank	N/A	Field duplicate results satisfied the evaluation criteria in the QAPP. The field QC results for the April 2003 Snowmelt sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	No duplicate analyses were evaluated for total suspended solids (TSS) due to insufficient sample volumes. The incomplete assessment of precision relative to the site-related matrix is not considered to materially affect the quality or usability of the data.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Yes	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Cond.	pH
ISCO-RR-12-T05N-SFW	0.40 UJ	0.0050 UJ	263 J	7.3 J
ISCO-RR-12-T06N-SFW	0.40 UJ	0.0050 UJ	264 J	7.6 J
ISCO-LR-16-T08N-SFW	0.40 UJ	---	321 J	7.9 J
ISCO-RR-8-T07N-SFW	0.40 UJ	0.0500 UJ	225 J	7.8 J
ISCO-RR-8-T08N-SFW	0.40 UJ	0.0050 UJ	228 J	7.8 J
ISCO-RR-15-T05N-SFW	0.40 UJ	0.0050 UJ	277 J	7.7 J
ISCO-RR-6-T08N-SFW	0.40 UJ	0.0050 UJ	239 J	7.7 J
ISCO-RR-8-T05N-SFW	0.40 UJ	0.0050 UJ	234 J	7.8 J
ISCO-RR-8-T06N-SFW	0.40 UJ	0.0050 UJ	234 J	7.8 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P)	---	---	0.3	---	0.5	0.403	0.3	ISCO-LR-16-T08N-SFW ISCO-RR-12-T06N-SFW ISCO-RR-15-T05N-SFW ISCO-RR-8-T05N-SFW ISCO-RR-8-T07N-SFW	U MB-I
Zinc (P)	2.6	4.3	4.1	4.2	4.0	3.114	1.4	ISCO-LR-16-D08N-SFW ISCO-RR-8-D05N-SFW ISCO-RR-8-D06N-SFW ISCO-RR-8-D07N-SFW ISCO-RR-8-D08N-SFW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT100C

Sampling Event: April 2003 Snowmelt (Day 3, 5)

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 07/28/03

Peer Reviewer: Stacey Coker

Date Completed: 07/30/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses			
				Metals	Inorganics	pH	Conductivity
ISCO-RR-12-T07N-SFW	SA	524723	W	X	X	X	X
ISCO-RR-12-D07N-SFW	SA	524724	W	X			
ISCO-RR-12-T07D-SFW	FD	524725	W		X[3]		
ISCO-RR-12-T08N-SFW	SA	524726	W	X	X	X	X
ISCO-RR-12-D08N-SFW	SA	524727	W	X			
ISCO-RR-12-T08D-SFW	FD	524728	W		X[4]		
ISCO-RR-6-T09N-SFW	SA	525006	W	X	X	X	X
ISCO-RR-6-D09N-SFW	SA	525007	W	X			
ISCO-RR-6-T10N-SFW	SA	525008	W	X	X	X	X
ISCO-RR-6-D10N-SFW	SA	525009	W	X			
ISCO-RR-6-T11N-SFW	SA	525010	W	X	X	X	X
ISCO-RR-6-D11N-SFW	SA	525011	W	X			
ISCO-RR-6-T12N-SFW	SA	525012	W	X	X	X	X
ISCO-RR-6-D12N-SFW	SA	525013	W	X			
ISCO-RR-8-T09N-SFW	SA	525014	W	X[2]	X	X	X
ISCO-RR-8-D09N-SFW	SA	525015	W	X			
ISCO-RR-8-T10N-SFW	SA	525016	W	X	X	X	X
ISCO-RR-8-D10N-SFW	SA	525017	W	X[2]			
ISCO-RR-8-T11N-SFW	SA	525018	W	X	X[2]	X	X
ISCO-RR-8-D11N-SFW	SA	525019	W	X			

Matrix: W = Water
QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2]Extra volume for matrix QC.
[3] Field duplicate for modified list of inorganic parameters.
[4] Field duplicate for TSS only.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the laboratory case narrative are addressed in the relevant sections in the table.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	No problems were noted.
Holding Times	No	The 48-hour holding times for nitrate and nitrite were exceeded by several hours for the samples in this data package. Accordingly, analyses conducted outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for samples were taken 16 after sampling, and 14 days beyond log-in. The pH for all samples was measured approximately five hours after log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value.
Matrix QC • MS/MSD ISCO-RR-8-T09N-SFWMS ISCO-RR-8-D10N-SFWMS ISCO-RR-8-T11N-SFWMS • PDS ISCO-RR-8-T09N-SFWA ISCO-RR-8-D10N-SFWA ISCO-RR-8-T11N-SFWA • LD ISCO-RR-8-T09N-SFWD ISCO-RR-8-D10N-SFWD ISCO-RR-8-T11N-SFWD	No	All spike recoveries and duplicate results were within acceptance limits with the exception of the selenium post-digestion spike (PDS) recovery for sample ISCO-RR-8-T09N-SFW. The PDS recovery was 73%, slightly outside the acceptance range of 75-125%. The selenium result for this sample was not qualified due to the fact that the matrix spike yielded an acceptable recovery. The matrix quality control results for the April 2003 Snowmelt sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) ISCO-RR-8-T09N-SFWSL ISCO-RR-8-T10N-SFWSL ISCO-RR-8-D10N-SFWL • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses on samples ISCO-RR-8-T09N-SFW and ISCO-RR-8-D10N-SFW were not applicable for 19 of the 24 metal analytes, as only five metal analytes (As, Mg, Se, K, and Na) reported initial sample results which were sufficiently larger (x50) than the IDL, (run at straight analyses). Of the 5 applicable metal analytes, several exhibited percent differences in excess of 10%, thereby not satisfying the ≤10% difference between the original sample and its 5-fold dilution criterion. Accordingly, several results for the metals summarized in the Table 1.3 were qualified as estimated (J/UJ) in the parent sample with varying directions of bias. Snowmelt samples were collected using ISCO automated water sampling devices. The analyses conducted on snowmelt samples were reduced relative to analyses specified for surface water samples in the Field Sampling plan because of the limited volume available due to nature of the sample collection technique and sampling design. While all bottles/analyses specified in the Automated Samplers on the Red River- Field Sampling Plan (dated 03/14/03) were collected and analyzed, the cation/anion balance calculation could not be done due to the reduced list of inorganic analytes. In addition, the ratios of the calculated versus measured TDS could not be determined due to the reduced analyte list.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate ISCO-RR-12-T07N/T07D-SFW ISOC-RR-12-T08N/T08D-SFW • Rinsate Blank • Field Blank • Trip Blank	Yes	Field duplicate results satisfied the evaluation criteria in the QAPP. The field QC results for the April 2003 Snowmelt sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Conductivity	pH
ISCO-RR-12-T07N-SFW	0.40 UJ	0.0050 UJ	269 J	7.6 J
ISCO-RR-12-T07D-SFW	0.40 UJ	0.0050 UJ	271 J	7.7 J
ISCO-RR-12-T08N-SFW	0.40 UJ	0.0050 UJ	274 J	7.7 J
ISCO-RR-6-T09N-SFW	0.40 UJ	0.0050 UJ	10.5 J	6.9 J
ISCO-RR-6-T10N-SFW	0.40 UJ	0.0050 UJ	250 J	7.1 J
ISCO-RR-6-T11N-SFW	0.40 UJ	0.0050 UJ	233 J	7.3 J
ISCO-RR-6-T12N-SFW	0.40 UJ	0.0050 UJ	233 J	7.3 J
ISCO-RR-8-T09N-SFW	0.40 UJ	0.0050 UJ	247 J	7.3 J
ISCO-RR-8-T10N-SFW	0.40 UJ	0.0050 UJ	231 J	7.4 J
ISCO-RR-8-T11N-SFW	0.40 UJ	0.0050 UJ	234 J	7.4 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminium (P)	---	---	---	54.8	65.2	---	50.3	ISCO-RR-12-D07N-SFW ISCO-RR-12-D08N-SFW ISCO-RR-8-D11N-SFW	U CCB-I
Antimony (MS)	0.4	0.4	0.3	0.3	0.3	---	0.30	ISCO-RR-12-T07N-SFW	U CCB-I
Iron (P)	33.4	35.0	52.2	43.1	40.1	---	31.1	ISCO-RR-12-D07N-SFW ISCO-RR-6-D09N-SFW ISCO-RR-6-D10N-SFW ISCO-RR-6-D11N-SFW ISCO-RR-6-D12N-SFW ISCO-RR-8-D09N-SFW ISCO-RR-8-D10N-SFW ISCO-RR-8-D11N-SFW	U CCB-I
Nickel (P)	10.6	10.9	11.0	10.7	10.4	---	3.00	All samples	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Results and Qualifications

Analyte	Serial Dilution % Difference	Qualification Code
ISCO-RR-8-T09N-SFW		
Cadmium	11.0	J DL-L
Vanadium	38.4	J DL-H
Zinc	12.9	J DL-L
ISCO-RR-8-D10N-SFW		
Vanadium	44.0	J DL-H
Zinc	16.9	J DL-L

Qualification on the basis of serial dilution results was limited to the parent sample

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT101C

Sampling Event: April 2003 Snowmelt (Day 5)

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 07/29/03

Peer Reviewer: Stacey Coker

Date Completed: 07/29/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses			
				Metals	Inorganics	pH	Conductivity
ISCO-RR-8-T12N-SFW	SA	525021	W	X	X	X	X
ISCO-RR-8-D12N-SFW	SA	525022	W	X			
ISCO-RR-15-T09N-SFW	SA	525023	W	X	X	X	X
ISCO-RR-15-D09N-SFW	SA	525024	W	X			
ISCO-RR-15-T10N-SFW	SA	525025	W	X	X	X	X
ISCO-RR-15-D10N-SFW	SA	525026	W	X			
ISCO-RR-15-T11N-SFW	SA	525027	W	X	X	X	X
ISCO-RR-15-D11N-SFW	SA	525028	W	X			
ISCO-RR-15-T12N-SFW	SA	525029	W	X	X	X	X
ISCO-RR-15-D12N-SFW	SA	525030	W	X			
ISCO-LR-16-T09N-SFW	SA	525031	W	X	X	X	X
ISCO-LR-16-D09N-SFW	SA	525032	W	X			
ISCO-LR-16-T10N-SFW	SA	525033	W	X	X	X	X
ISCO-LR-16-D10N-SFW	SA	525034	W	X			
ISCO-LR-16-T11N-SFW	SA	525035	W	X	X	X	X
ISCO-LR-16-D11N-SFW	SA	525036	W	X			
ISCO-LR-16-T12N-SFW	SA	525037	W	X	X[2]	X	X
ISCO-LR-16-D12N-SFW	SA	525038	W	X			
ISCO-RR-12-T09N-SFW	SA	525039	W	X	X[2]	X	X
ISCO-RR-12-D09N-SFW	SA	525040	W	X			

Matrix: W = Water
QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Inadequate volume was present in the W-8s sent for TSS test to be done.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the laboratory case narrative are addressed in the relevant sections in the table.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, sample ISCO-RR-15-T12N-SFW, for the analysis of metals, was received with a pH greater than 2 and subsequently required the addition of HNO3- to attain the proper pH for preservation. No qualification was necessary for the metal results for sample ISCO-RR-15-T12N-SFW due to the fact that the nitric acid added would have dissolved most of the metals that might have precipitated out. This was further supported by the observation that the diluted metal concentrations are comparable to the total metal concentrations. The laboratory log-in sheet noted bottles for TSS analyses were not received for samples ISCO-LR-16-T12N-SFW and ISCO-RR-12-T09N-SFW, as listed on the COC. Consequently, TSS analyses were not conducted on either sample. Verbal contact was made with Nicole Hunter (on-site sample manager) on 08/25/03 (1030AM). She distinctly remembers sampling and sending W-8 bottles for these samples. It would appear that this was an error on the side of the laboratory. Either the samples were lost upon log-in or they were assigned to a different sample delivery group.
Holding Times	No	The 48-hour holding times for nitrate and nitrite were exceeded by several hours for all samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for samples were taken 15 after sampling, and 13 days beyond log-in. The pH for all samples was measured approximately five hours after log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 Snowmelt sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) ISCO-RR-8-T12N-SFWSL • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample ISCO-RR-8-T12N-SFW was not applicable for 22 of the 24 metal analytes, as two metal analytes (Ca, and MN) reported initial sample results which were sufficiently larger (x50) than the IDL, (adjusted for dilution). Both calcium and manganese exhibited percent differences less than 10%, thereby satisfying the ≤10% difference between the original sample and its 5-fold dilution criterion. It was therefore unnecessary to qualify any data on the basis of serial dilution. Snowmelt samples were collected using ISCO automated water sampling devices. The analyses conducted on snowmelt samples were reduced relative to analyses specified for surface water samples in the Field Sampling plan because of the limited volume available due to nature of the sample collection technique and sampling design. While all bottles/analyses specified in the Automated Samplers on the Red River- Field Sampling Plan (dated 03/14/03) were collected and analyzed, the cation/anion balance calculation could not be done due to the reduced list of inorganic analytes. In addition, the ratios of the calculated versus measured TDS could not be determined due to the reduced analyte list.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		All manganese results for samples ISCO-LR-16-D12N-SFW, ISCOLR-16-T12N-SFW, ISCO-RR-12-D09N-SFW and ISCO-RR-12-T09N-SFW were qualified as estimate (J/UJ TVP) because the dissolved manganese results were greater than the total manganese results. The zinc results for samples ISCO-RR-12-D09N-SFW and ISCO-RR-12-T09N-SFW were qualified as estimated (J/UJ TVP-I) because the dissolved zinc results were greater than the total zinc results.
Field QC • Field Duplicate ISCO-RR-12-T09N-SFW ISCO-RR-12-T09D-SFW-(WAT102C) • Rinsate Blank • Field Blank • Trip Blank	N/A	For samples ISCO-RR-12-T01N-SFW and ISCO-RR-T01D-SFW(WAT102) the manganese field duplicate results were outside evaluation criteria. Manganese results for these samples were qualified as estimated (J FD-I). The field QC results for the April 2003 Snowmelt sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	Samples ISCO-RR-12-T09N-SFW and ISCO-LR-16-T12-SFW were not analyzed for TSS, as the containers were not received by the laboratory. Inquires have been made to determine the status of the analyses for these samples.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Conductivity	pH
ISCO-RR-8-T12N-SFW	0.40 UJ	0.0050 UJ	235 J	7.6 J
ISCO-RR-15-T09N-SFW	0.40 UJ	0.0050 UJ	278 J	7.5 J
ISCO-RR-15-T10N-SFW	0.40 UJ	0.0050 UJ	273 J	7.5 J
ISCO-RR-15-T11N-SFW	0.40 UJ	0.0050 UJ	274 J	7.5 J
ISCO-RR-15-T12-SFW	0.40 UJ	0.0050 UJ	277J	7.5 J
ISCO-LR-16-T09N-SFW	0.40 UJ	0.0050 UJ	329 J	7.6 J
ISCO-LR-16-T10N-SFW	0.40 UJ	0.0050 UJ	329 J	7.8 J
ISCO-LR-16-T11N-SFW	0.40 UJ	0.0050 UJ	337 J	7.8 J

Sample	Nitrate as N	Nitrite	Conductivity	pH
ISCO-LR-16-T12N-SFW	0.42 J	0.0050 UJ	337 J	7.8 J
ISCO-RR-12-T09N-SFW	0.40 UJ	0.0050 UJ	268 J	7.7 J
ISCO-RR-8-T12N-SFW	0.40 UJ	0.0050 UJ	235 J	7.6 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminium (P)	---	---	61.6	56.7	---	---	50.3	ISCO-LR-16-D09N-SFW ISCO-LR-16-D10N-SFW ISCO-LR-16-D11N-SFW ISCO-LR-16-D12N-SFW ISCO-RR-12-D09N-SFW ISCO-RR-15-D11N-SFW ISCO-RR-15-D12N-SFW	U CCB-I
Antimony (MS)	0.5	0.4	0.4	0.5	2.4	---	0.30	ISCO-LR-16-T10N-SFW ISCO-RR-8-T12N-SFW	U CCB-I
Iron (P)	---	38.6	47.6	45.2	---	---	31.1	ISCO-LR-16-D09N-SFW ISCO-LR-16-T12N-SFW ISCO-RR-12-D09N-SFW ISCO-RR-12-T09N-SFW ISCO-RR-8-D12N-SFW	U CCB-I
Lead (MS)	-0.2	-0.2	-0.2	-0.2	-0.2	---	0.10	ISCO-LR-16-D09N-SFW ISCO-LR-16-D10N-SFW ISCO-LR-16-D11N-SFW ISCO-LR-16-D12N-SFW ISCO-LR-16-T12N-SFW ISCO-RR-12-D09N-SFW ISCO-RR-15-D09N-SFW ISCO-RR-15-D01N-SFW ISCO-RR-15-D11N-SFW ISCO-RR-15-D12N-SFW	UJ CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit
Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT102C

Sampling Event: April 2003 Snowmelt (Day 5)

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 07/29/03

Peer Reviewer: Stacey Coker

Date Completed: 07/30/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses			
				Metals	Inorganics	pH	Conductivity
ISCO-RR-12-T09D-SFW	FD	525051	W	X			
ISCO-RR-12-T10N-SFW	SA	525052	W	X	X	X	X
ISCO-RR-12-D10N-SFW	SA	525053	W	X			
ISCO-RR-12-D10D-SFW	FD	525054	W	X			
RB03T-SFW	SA	525055	W	X	X		
ISCO-RR-12-T12D-SFW	FD	525056	W		X[2]		
ISCO-RR-12-T12N-SFW	SA	525057	W	X	X	X	X
ISCO-RR-12-D12N-SFW	SA	525058	W	X			
ISCO-RR-12-T11N-SFW	SA	525059	W	X	X	X	X
ISCO-RR-12-D11N-SFW	SA	525060	W	X			
ISCO-RR-12-T11D-SFW	FD	525061	W		X[3]		

Matrix: W = Water
QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Field duplicate for TSS only.
[3] Field duplicate for modified list of inorganic parameters.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

Any issues noted in the laboratory case narrative are addressed in the relevant sections in the table.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory log-in sheet noted sample ISCO-RR-12-T09D-SFW was marked on the COC for the analyses of metals, inorganic suite, pH, and conductivity. However, the volume provided was only for the total metals analysis. In addition, sample ISCO-RR-12-T12D-SFW was marked on the COC for metals, inorganic suite, pH, and conductivity analyses. However, the volume provided was only for the TSS analysis. Both of these field QC samples were field duplicates collected to assess the representativeness of the samples to the medium and the overall sampling precision. According to the sampling plan, it was the intention to analyze ISCO-RR-12-T09D for metals only and ISCO-RR-12-T12D-SFW for TSS. The analyses which were required for these field duplicate samples were run and presented with the data in this package. It was therefore unnecessary to qualify any data on the basis of COC or sample receipt.
Holding Times	No	The 48-hour holding times for nitrate and nitrite were exceeded by several hours for the majority of samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for samples were taken 15 after sampling, and 13 days beyond log-in. The pH for all samples was measured approximately five hours after log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 Snowmelt sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) • ISCO-RR-12-T09D-SFWSL • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis on sample ISCO-RR-12-T09D-SFW was not applicable for 22 of the 24 metal analytes, as only 2 metal analytes reported initial sample results sufficiently larger (x50) than the IDL, (adjusted for dilution). The two metal analytes exhibited percent differences below 10%, thereby satisfying the ≤10% difference between the original sample and its 5-fold dilution criterion. Accordingly, no qualification of data on the basis of serial dilution was considered necessary. Snowmelt samples were collected using ISCO automated water sampling devices. The analyses conducted on snowmelt samples were reduced relative to analyses specified for surface water samples in the Field Sampling plan because of the limited volume available due to nature of the sample collection technique and sampling design. While all bottles/analyses specified in the Automated Samplers on the Red River- Field Sampling Plan (dated 03/14/03) were collected and analyzed, the cation/anion balance calculation could not be done due to the reduced list of inorganic analytes. In addition, the ratios of the calculated versus measured TDS could not be determined due to the reduced analyte list.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate ISCO-RR-12-T09N-SFW (WAT101) ISCO-RR-12-T09D-SFW • Rinsate Blank RB03T-SFW • Field Blank • Trip Blank	Yes	For samples ISCO-RR-12-T01N-SFW (WAT101) and ISCO-RR-T01D-SFW the manganese field duplicate results were outside evaluation criteria. Manganese results for these samples were qualified as estimated (J FD-I). The rinsate blank results associated and analyzed with the data in this package (RB03T-SFW) were nondetect for all analytes with the exception of total dissolved solids (28.0 mg/L). The field QC results for the April 2003 Snowmelt sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Conductivity	pH
ISCO-RR-12-T01N-SFW	0.4 UJ	0.0050 UJ	272 J	7.4 J
RB03T-SFW	---	---	0.35 J	7.4 J
ISCO-RR-12-T12N-SFW	0.42 J	0.0050 UJ	271 J	7.4 J
ISCO-RR-12-T11N-SFW	0.40 UJ	0.0050 UJ	275 J	7.4 J
ISCO-RR-12-T11D-SFW	0.40 UJ	0.0050 UJ	275 J	7.4 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Copper (P)	---	---	---	---	---	5.555	1.5	All samples with the exception of: RB03T-SFW	U MB-I
Nickel (P)	---	---	----	---	---	8.256	3.0		U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA VALIDATION REPORT
FOR STORM EVENT #1

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004

URS

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Project No. 22236241.00100

140400

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Non-Valid Matrix Spikes 3-1
3.2.2 Laboratory Performance Review (LPR) Findings 3-1

Section 4 Collective Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.1.1 Post-Digestion Spikes 4-3
4.2 Inorganic Laboratory Duplicate Results (Precision Evaluation) 4-3
4.3 ICP Serial Dilution Results 4-3

Section 5 Collective Assessment of Filed QC Results 5-1

5.1 Field Duplicate Agreement 5-1
5.2 Rinsate Blank Results 5-2

Section 6 Overall Data Quality Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-2
6.4 Representativeness 6-2
6.5 Comparability 6-2
6.6 Sensitivity 6-3

List of Tables

Table 1-1 Summary of Storm Event Surface Water Samples Collected on July 28, 2003

Table 4-1 Field Samples Designated for Matrix QC Analysis

Table 4-2 Frequency Requirements for Matrix QC

Table 4-3 Inorganics Matrix Spike Results

Table 4-4 Metals Matrix Spike Results

Table 4-5 ICP Serial Dilution Results

Table 4-6 ICP Serial Dilution Overall Assessment

TABLE OF CONTENTS

Table 5-1 Summary of Field Duplicate Samples for Storm Event #1
Table 5-2 Field Duplicate Collection Frequency for Storm Event #1
Table 5-3 Summary of Field Duplicate ISCO Water Sample Exceedances
Table 5-4 Summary of Rinsate Blank Samples Collected for Storm Event #1
Table 5-5 Summary of Rinsate Blank Results and Additional Qualifications
Table 6-1 Summary of Precision Assessment for Storm Event #1
Table 6-2 Summary of Accuracy Assessment for Storm Event #1

List of Attachments

Attachment 1.1 Data Review Summary for Data Package WAT155S
Attachment 1.2 Data Review Summary for Data Package WAT156S

This Data Validation Report (DVR) provides a general overview of the usability of the surface water chemical analytical data obtained July 28, 2003 during the Storm Event #1 at Molycorp Questa Mine in Questa, New Mexico. This report contains the results and process of the sample specific data reviews and collective evaluations for the surface water samples collected by the ISCO autosamplers in support of the Remedial Investigation/Feasibility Study (RI/FS).

The storm water samples were submitted to Severn Trent Laboratories (STL) Burlington in Colchester, Vermont for chemical analysis. The number of samples collected and analyses conducted were accordance with the RI/FS Quality Assurance Project Plan, Appendix A – Field Sampling Plan, Automatic Samplers on the Red River – Field Sampling Plan, dated March 14, 2003. The analytical results were reported in two packages. This event was considered a moderate storm as three of the five autosamplers were triggered by the change in stream flow. The autosampler at location RR-8 was not triggered due to a technical problem with the power supply.

Table 1-1 summarizes the ISCO surface water samples collected by the autosamplers, along with the analyses performed on each sample and the accompanying QC samples.

Table 1-1
Summary of Storm Event Surface Water Samples collected on July 28, 2003

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganics
ISCO-LR-16-T01N-SFW (WAT156S)	X	X	X
ISCO-LR-16-T02N-SFW (WAT156S)	X	X	X
ISCO-LR-16-T03N-SFW (WAT155S)	X	X	X
ISCO-LR-16-T04N-SFW (WAT155S)	X	X	X
ISCO-RR-12-T01N-SFW (WAT156S)	X, FD	X	X
ISCO-RR-12-T02N-SFW (WAT156S)	X	X, FD	X
ISCO-RR-12-T03N-SFW (WAT155S)	X	X	X, FD [2]
ISCO-RR-12-T04N-SFW (WAT155S)	X	X	X, FD [3]
ISCO-RR-6-T01N-SFW (WAT155S)	X, MS, LD	X	X
ISCO-RR-6-T02N-SFW (WAT155S)	X	X, MS, LD	X
ISCO-RR-6-T03N-SFW (WAT155S)	X	X	X, MS, LD [4]
ISCO-RR-6-T04N-SFW (WAT155S)	X	X	X, MS, LD [5]
Number of samples	12	12	12
Number MS/LD	1	1	1
Number Field Duplicates	1	1	1
Number Rinsate Blanks	1	1	1

MS = Matrix Spike LD = Laboratory Duplicate FD = Field Duplicate RB = Rinsate Blank

[1] The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.
[2] Field duplicate for all inorganics except TSS.
[3] Field duplicate for TSS only.
[4] MS and LD for chloride and nitrate.
[5] MS and LD for fluoride, nitrite, sulfate; LD for TDS, and TSS also.

The data review process evaluated sample-specific and laboratory performance criteria in accordance with the standard operating procedure (SOP) 12.1. As mentioned in the SOP, all RI/FS data generated for the Questa Mine received an evaluation of sample-specific parameters. In addition, 10% of the data packages (per analysis type per event/episode) were reviewed for laboratory performance parameters. The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Sample-specific reviews evaluated the following sample related parameters:

- Case narrative comments
- Chain-of-Custody/Sample Receipt
- Holding Times
- Method Blank (Preparation Blank)
- Matrix-Dependent Quality Control
  - Matrix Spike Analysis
  - Laboratory duplicate Analysis
- Method-Specific Quality Control Measures
  - Inorganic Method Specific QC Measures

    Post Digestion Spike Analysis

    ICP Serial Dilution Tests

    Internal Standard Performance

    Cation/Anion Balance Evaluation
- Total vs Partial Balance
- Field quality control samples
  - Field Duplicate Agreement
  - Rinsate Blank Results

Evaluation of laboratory performance parameters provided an overall representation of the analytical system at the time the samples were analyzed. The laboratory performance review evaluated parameters in control of the laboratory, but independent of the field samples analyzed, as follows:

- Interference Check Standard
- Initial Calibration
- Continuing Calibration Verification
- Laboratory Control Sample Analysis
- Compound Identification

- Target Analyte Quantification
- Verification
- Method Specific Quality Control Check

If any potential systematic problems were determined upon review of the laboratory performance parameters in the selected packages evaluated (meeting the 10% criteria), the review parameter was evaluated in the other data package of Storm Event #1 to determine the need for data qualification. Instances, in which professional judgment was exercised in evaluating the need for data qualification, the basis for this rationale was provided in the data review summary.

Upon completion of the sample-specific reviews and laboratory performance reviews, a collective assessment for the event was performed. Site-specific matrix spike, laboratory duplicate, serial dilution, blank (field and rinsate, when applicable), and field duplicate results were assessed collectively by matrix per event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered more representative of the site sample matrix and a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 3.0 describes sample specific data review findings and several data quality issues affecting all of the sediment packages. Section 4.0 presents the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Section 5.0 summarizes the collective summary of the field QC results (field and rinsate blanks, when applicable, and field duplicate results) and the resultant sample qualification. Lastly, an overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes the individual data review summaries for data packages WAT155S and WAT156S. In order to attain the frequency requirements for laboratory performance reviews, one data package, WAT155S, was evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. The electronic database contains the finalized qualified data, including validation qualifiers, reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were identified which globally affected all relevant Storm Event #1 samples analyzed for the Storm Event #1 sampling event**.** Although most of the issues have been addressed in the individual summary reports, these common issues and conclusions are summarized below.

3.2.1 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.2 Laboratory Performance Review (LPR) Findings

As mentioned previously, one data package was given a full validation to assess the performance of the laboratory for all analyses. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. It was not necessary to evaluate any laboratory performance parameters in the remaining data package.

Inorganic matrix QC parameters which were assessed in a collective fashion consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. The site-specific matrix QC results were assessed collectively for the Storm Event #1 to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.3 present the collective matrix QC results associated with the samples in this event and the resultant data qualifiers.

Two surface water samples were designated for total metals, dissolved metals, and inorganics matrix spike analyses. Table 4-2 summarizes the breakdown of frequency requirements for each of the analyses for the Storm Event #1.

Table 4-1
Field Samples Designated for Matrix QC Analysis

Sample ID	Analyses		
	Total Metals	Dissolved Metals	Inorganics
ISCO-RR-6-T01N-SFW (WAT155S)	X	---	---
ISCO-RR-6-D02N-SFW (WAT155S)	---	X	---
ISCO-RR-6-T03N-SFW (WAT156S)	---	---	X [1]
ISCO-RR-6-T04N-SFW (WAT156S)	---	---	X [2]

[1] MS and LD for chloride and nitrate.

[2] MS and LD for fluoride, nitrite, sulfate and LD for TSS and TDS.

Table 4-2
Frequency Requirements for Matrix QC

Analyses	# MS Samples	Total # Samples	Percentage (%)
Total Metals	1	12	8.3
Dissolved Metals	1	12	8.3
Inorganics	1	12	8.3

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results.

In general, qualification was limited to the parent sample if less than a quarter of the applicable matrix spike recoveries were outside the acceptance range. Conversely, if more than a quarter of the applicable matrix spike recoveries were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average matrix spike recovery, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

A number of MS recoveries were outside of the acceptance limits of 75-125% for both total and dissolved metals. Tables 4-3 and 4-4 summarize the inorganics and metals MS results, including

the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 4-3
Inorganics Matrix Spike Results

Analyte	Number of Valid Spikes/ Total Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
Chloride	1	0	0	103.7	None
Nitrate as N	1	0	0	106.0	None
Fluoride	1	0	0	89.5	None
Sulfate	1	0	0	75.0	None
Nitrite as N	1	0	0	95.2	None

Table 4-4
Metals Matrix Spike Results

Analyte	Total				Dissolved				Action
	# Valid	%R <75%	%R > 125%	Avg %R	# Valid	%R <75%	%R > 125%	Avg %R	
Aluminum	1	0	1	135.6	1	0	0	98.8	J MS-H for positive total fraction results NQ for nondetect results
Antimony	1	0	0	91.1	1	0	0	93.5	None
Arsenic	1	0	0	82.2	1	0	0	87.1	None
Barium	1	0	0	101.3	1	0	0	98.6	None
Beryllium	1	0	0	105.0	1	0	0	101.3	None
Boron	1	0	0	107.6	1	0	0	104.4	None
Cadmium	1	0	0	90.4	1	0	0	87.2	None
Chromium	1	0	0	107.4	1	0	0	103.1	None
Cobalt	1	0	0	104.5	1	0	0	99.6	None
Copper	1	0	0	87.4	1	0	0	84.6	None
Iron	1	0	0	NA	1	0	0	106.6	None
Lead	1	0	0	110.8	1	0	0	106.1	None
Manganese	1	0	0	103.5	1	0	0	91.6	None
Mercury	1	0	0	86.7	1	0	0	89.9	None
Molybdenum	1	0	0	80.1	1	0	0	78.7	None
Selenium	1	0	0	78.5	1	0	0	87.6	None
Nickel	1	0	0	87.4	1	0	0	89.1	None
Thallium	1	0	0	104.6	1	0	0	106.9	None
Silver	1	0	1	128.3	1	0	1	125.5	J MS-H for positive results NQ for nondetect results
Vanadium	1	0	0	97.1	1	0	0	98.7	None
Zinc	1	0	0	104.4	1	0	0	95.0	None

NQ = No Qualification for a nondetect with a high bias

The table above indicates that the accuracy of the analyses relative to the site-specific matrix was acceptable, as acceptable recoveries were reported for all metal analytes, with the exceptions of aluminum and silver. All detected aluminum results for the total fraction were qualified on the basis of the one unacceptable matrix spike recovery. All detected silver results were qualified as estimated for both the total and dissolved fractions.

4.1.1 Post-Digestion Spikes

Post-digestion spikes were conducted on all ICP and ICP/MS analytes to determine whether matrix recoveries outside of the acceptance range were the result of sample matrix, or due to a bias in the analytical system. All post digestion recoveries for those analytes recovered outside of the acceptance range were reviewed and recovered within the range of 75-125%. Therefore, no qualification of data was assigned for any of the metal analytes on the basis of post-digestion spike recovery, as it was likely that all matrix spike exceedances were due to a matrix effect on digestion rather than a bias in the analytical system.

4.2 INORGANIC LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Laboratory duplicate sample results were evaluated to assess the precision of the laboratory analyses. Additional volumes of samples ISCO-RR-6-T01N-SFW, ISCO-RR-6-D02N-SFW, ISCO-RR-6-T03N-SFW, and ISCO-RR-6-T04N-SFW were submitted for use in laboratory duplicate analyses. As shown in Table 4-1, one laboratory duplicate analysis was conducted for each analyte. The evaluation criteria used are summarized in SOP 12.1. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs), which were used as the quantitative reporting limit.

The RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target all analytes were within the QAPP acceptance limits for all laboratory duplicate analyses. No qualification on the basis of laboratory duplicate results was necessary. Therefore, the overall level of precision demonstrated is considered to be acceptable.

4.3 ICP SERIAL DILUTION RESULTS

ICP serial dilutions were performed on metal samples in every data package. These analyses were run on the same samples as were designated for matrix QC analyses, or otherwise randomly selected in data packages in which there were no QC samples designated. These analyses were used to evaluate whether or not significant physical or chemical interferences existed due to sample matrix. This was accomplished by analyzing the sample and a five-fold dilution of the sample. The percent difference (%D) between these two concentrations was compared for those analytes for which the serial dilution analysis was applicable (i.e., the initial concentrations were sufficiently higher (50x) than the IDL, accounting for dilution).

Table 4-5 summarizes each sample utilized for a serial dilution analysis, along with the associated applicable analytes, and the results exceeding the acceptance criterion of $\leq$10%D.

Table 4-5
ICP Serial Dilution Results

Sample ID	Applicable Analytes (%D>10% in bold)
TOTAL FRACTION	
ISCO-RR-6-T01N-SFW (WAT155S)	Al, Sb, **As (14.2%),** Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mn, **Mo (22.1%),** Ni, Tl, Ag, V, Z
ISCO-RR-12-T01N-SFW (WAT156S)	Al, Ca, Cu, Fe, Pb, Mg, Mn, Ni, Zn
DISSOLVED FRACTION	
ISCO-RR-6-D02N-SFW (WAT155S)	Al, Sb, As, Ba, Be, B, **Cd (11.0%),** Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, **Mo (22.8%),** Ni, Tl, Ag, V, Zn

Table 4-6 summarizes the average % Ds for each of the analytes, along with the percent of applicable analytes that exceeded control criteria (10%) for ISCO surface water samples, and the resultant qualifiers based on the collective assessment. Where exceedances were identified, the diluted result is generally considered more accurate as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result.

Qualifications were generally limited to the parent samples if less than a quarter of the valid serial dilution results were outside of the acceptance range. Conversely, if more that a quarter of the valid recoveries were out, qualification may have been extended to the remainder of the data set. However, additional factors such as the number of valid measurements relative to the size of the sample set and the magnitude of outages were also taken into consideration.

Table 4-6
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	# of Valid Results	%Ds >10%	% Valid	Avg. %D	# of Valid Results	%Ds >10%	% Valid	Avg. %D	
Aluminum	2	0	0%	1.3	1	0	0%	2.0	None
Antimony	1	0	0%	4.9	1	0	0%	3.6	None
Arsenic	1	1	100%	14.2	1	0	0%	5.5	J DL-L parent sample only
Barium	1	0	0%	0.4	1	0	0%	1.4	None
Beryllium	1	0	0%	0.3	1	0	0%	1.7	None
Boron	1	0	0%	0.6	1	0	0%	0.7	None
Cadmium	1	0	0%	9.2	1	1	100%	11.0	J DL-L parent sample only
Calcium	2	0	0%	0.4	1	0	0%	2.3	None
Chromium	1	0	0%	0.2	1	0	0%	0.5	None
Cobalt	1	0	0%	0.3	1	0	0%	1.5	None
Copper	2	0	0%	3.6	1	0	0%	5.1	None
Iron	2	0	0%	0.9	1	0	0%	5.7	None
Lead	2	0	0%	0.9	1	0	0%	2.4	None
Magnesium	1	0	0%	0.2	1	0	0%	0.0	None
Manganese	2	0	0%	0.5	1	0	0%	0.5	None
Molybdenum	1	1	100%	22.1	1	1	100%	22.8	All results J/UJ DL-L
Nickel	2	0	0%	2.4	1	0	0%	1.5	None

Analyte	Total				Dissolved				Action
	# of Valid Results	%Ds >10%	% Valid	Avg. %D	# of Valid Results	%Ds >10%	% Valid	Avg. %D	
Potassium	0	---	---	---	0	---	---	---	None
Selenium	0	---	---	---	0	---	---	---	None
Silver	1	0	0%	4.1	0	---	---	----	None
Sodium	0	---	0%	---	0	---	---	---	None
Thallium	1	0	0%	2.1	1	0	0%	3.5	None
Vanadium	1	0	0%	0.2	1	0	0%	1.4	None
Zinc	2	0	0%	2.4	1	0	0%	4.4	None

--- = Not applicable serial dilution results

As is evident from the table above, four serial dilution results were in excess of 10%. Only the parent samples were qualified for both arsenic and dissolved cadmium as the exceedances were marginal (i.e. <15%). However, for molybdenum, both total and dissolved fractions reported %Ds in excess of 10% and the exceedances were considered more significant (i.e. >20%). As such, all molybdenum results were qualified as estimated with a low bias direction assigned. Overall, the serial dilution results suggest that matrix interference were minimal for these samples.

Site-specific field duplicate samples and rinsate blanks were assessed collectively by matrix for the Storm Event #1 to determine the need for qualification of sample results of similar matrices. The sections to follow summarize the results for these QC samples and any collective qualifications arising from the assessments.

5.1 FIELD DUPLICATE AGREEMENT

The field duplicate agreement assessment evaluated the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, as follows. When both concentration results were sufficiently greater (5x) the RL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤30%. If one or both of the concentration results were less than 5x the RL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤2x the RL. Table 5-1 summarizes the field duplicate samples, per parameter. The breakdown of field duplicate pair samples per analysis and fraction is shown in able 5-2.

In general, qualification was limited to the parent sample if less than a quarter of the field duplicate results were outside the acceptance range. Conversely, if more than a quarter of the field duplicate results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the magnitude of the exceedances (marginal vs. gross) and the complexity of the sample matrix.

Table 5-1
Summary of Field Duplicate Samples for Storm Event #1

Sample ID	Analyses		
	Total Metals	Dissolved Metals	Inorganics
ISCO-RR-12-T01N/T01D-SFW (WAT156S)	X	---	---
ISCO-RR-12-D02N/D02D-SFW (WAT156S)	---	X	---
ISCO-RR-12-T03N/T03D-SFW (WAT155S)	---	---	X (but not TSS)
ISCO-RR-12-T04N/T04D-SFW (WAT155S)	---	---	X (TSS only)

Table 5-2
Field Duplicate Frequency for Storm Event #1

Analyses	Number of FD samples	Total Samples	Percentage (%)
Total Metals	1	12	8.3%
Dissolved Metals	1	12	8.3%
Inorganics	1	12	8.3%

All field duplicate samples assessed for the Storm Event #1 were within the criteria specified in SOP 12.1 for metals and inorganics, with the few exceptions listed in the table below.

Table 5-3
Summary of Field Duplicate ISCO Water Sample Exceedances

Analyte	Sample ID	Criterion	Criterion Exceedances	Action
Aluminum	ISCO-RR-12-T01N/T01D-SFW (156S)	RPD ≤30%	51.6%	J FD-I for affected field duplicate samples only
Iron			50.5%	
Manganese			51.7%	
Zinc			53.4%	

With few exceptions, the applicable evaluation criterion was met. Qualifications on the basis of field duplicate disagreement were issued to the parent duplicate pairs only for aluminum, iron, manganese, and zinc, due to the minimal frequency and magnitude of the exceedances. Additionally, considering the changing nature of the sampling event, it is not unlikely for there to be greater variability between the bottles filled in a sequential fashion. Based on the FD results, the overall level of sampling and analytical precision demonstrated is considered to be acceptable for all analytes.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blank samples were prepared by pouring ASTM type II water over decontaminated sampling equipment and collecting the water in the appropriate sampling containers. Table 5-4 summarizes the rinsate blank samples associated with the samples collected during the Storm #1. The QAPP required frequency of 5% for the collection of rinsate blanks was met for the Storm Event #1.

Table 5-4
Summary of Rinsate Blank Samples
Collected for Storm Event #1

Sample ID	Metals	Inorganics
RB01T-SFW-072803 (WAT156S)	X	X
Frequency:	8.3%	8.3%

Table 5-5 summarizes the analytes detected in the associated RI/FS rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 5-5
Summary of Rinsate Blank Results and Additional Qualifications

Analytes	RL	# of Detections	Total # of RBs	Frequency of Detection	Average Conc. (mg/L)	x5 Criteria (mg/L)	Range for Field Samples (mg/L)	Action
Total Dissolved Solids	1.0	1	1	100%	58	290	58-192	Detected TDS results ≤290→U RB-I
Total Suspended Solids	0.5	1	1	100%	0.5	2.5	72.7-19,000	No Qualification necessary due to range of TSS concentrations in field samples

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results less than the calculated criteria concentration. Despite the fact that some results were qualified as nondetect on the basis of rinsate blank detections, the rinsate blank results are generally indicative of acceptable decontamination procedures as detections were infrequent and at low levels.

All data were considered acceptable for use in meeting project objectives as qualified. Multiple sample results were qualified as nondetect on the basis of contamination identified in the laboratory blank. Others were qualified as estimated on the basis of matrix spike recoveries. Lastly, several data results were qualified as estimated on the basis of holding time exceedances, serial dilution results, or total vs. partial disagreements. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment for Storm Event #1

Analysis Type	QC Measure	# of Analytes Measured	# Within Criteria	% Results within Criteria
Inorganics	FD	8	8	100%
	LD	8	8	100%
Total metals	FD	25	21	84%
	LD	25	25	100%
Dissolved Metals	FD	25	25	100%
	LD	25	25	100%

The percentage of acceptable precision measurements was 100% for all parameters, with the exception of 84% for the total metals field duplicate assessment. The overall level of precision demonstrated for all analyses collectively was considered to be acceptable.

6.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Percent of MS recoveries meeting criteria are summarized in Table 6-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters.

Table 6-2
Summary of Accuracy Assessment for Storm Event #1

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
Inorganics	MS	5	5	100%
Metals	MS	41	38	82.7%

The percentage of acceptable accuracy measurements ranged from 82.7-100%. The overall level of accuracy with respect to the site matrix demonstrated for all analyses collectively was considered to be acceptable.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results were considered usable as qualified for meeting project objectives. As such, the completeness for the sampling event is 100%, which satisfied the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the Storm Event #1. As relatively few data results were qualified on the basis of field duplicated disagreement, the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 5.2 indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analytes. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. While it is anticipated that all non-rejected data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT155S

Sampling Event: Storm Event #1, July 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

L.P. Reviewer: Karen Kronoveter

Date Completed: 04/10/04

Data Reviewer: Karen Kronoveter

Date Completed: 10/07/03

Peer Reviewer: Stacey Coker

Date Completed: 11/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
ISCO-RR-6-T02N-SFW	SA	536216	W	X	X
ISCO-RR-6-D02N-SFW	SA	536217	W	X	
ISCO-RR-6-T03N-SFW	SA	536218	W	X	X
ISCO-RR-6-D03N-SFW	SA	536219	W	X	
ISCO-RR-6-T04N-SFW	SA	536220	W	X	X
ISCO-RR-6-D04N-SFW	SA	536221	W	X	
ISCO-LR-16-T03N-SFW	SA	536222	W	X	X
ISCO-LR-16-D03N-SFW	SA	536223	W	X	
ISCO-LR-16-T04N-SFW	SA	536224	W	X	X
ISCO-LR-16-D04N-SFW	SA	536225	W	X	
ISCO-RR-6-T01N-SFW	SA	536226	W	X	X
ISCO-RR-6-D01N-SFW	SA	536227	W	X	
ISCO-RR-12-T03N-SFW	SA	536228	W	X	X
ISCO-RR-12-D03N-SFW	SA	536229	W	X	
ISCO-RR-12-T03D-SFW	FD	536230	W	X	X
ISCO-RR-12-T04N-SFW	SA	536231	W	X	X
ISCO-RR-12-D04N-SFW	SA	536232	W	X	
ISCO-RR-12-T04D-SFW	FD	536233	W	X	X

Matrix: W = Water
QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory did not calculate the cation/anion balances for the samples in this delivery group, as not all constituents were analyzed.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample ISCO-12-T04D-SFW was incorrectly labeled as ISCO-T04D-SFW. The correct site ID was determined based on the sampling time on the bottles. Both samples ISCO-RR-12-T03D-SFW and ISCO-RR-12-T04D-SFW were not properly recovered on the COC. The laboratory logged the samples in according to the sample labels which agreed with the sample collection scheme. These samples were analyzed for inorganics only.
Holding Times	No	As mentioned in the laboratory case narrative, samples were received outside the prescribed analytical holding time of 48 hours for nitrate and nitrite. This statement is not relevant to those sampled on 07/28/03.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS ISCO-RR-6-D02N-SFW ISCO-RR-6-T01N-SFW • LD	No	As mentioned in the laboratory case narrative, the metals analysis of the matrix spike associated with sample ISCO-RR-6-D02N-SFW resulted in a silver recovery slightly above the acceptance range of 75-125%, suggesting a potential high bias in the reporting of silver results. In addition, silver and aluminum were recovered above the criteria range for the matrix spike analysis of sample ISCO-RR-6-T01N-SFW, also suggestive of a potential high bias in the reporting of these analytes in samples. Table 1.3 summarizes the matrix spike detections along with the qualifications assigned to the parent sample. The matrix quality control results for Storm Event #1 will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) ISCO-RR-6-D02N-SFW ISCO-RR-6-T01N-SFW • Total vs. Partial Analyses	No	The internal standard recovery of ^{89}Y was high for the ICPMS analyses of samples ISCO-RR-6-T03N-SFW and ISCO-RR-6-T04N-SFW. The molybdenum results for these samples were compared to those from the trace ICP, and were found to be comparable. As such, data qualification was not considered to be necessary. Two serial dilution tests were conducted on matrix spike samples ISCO-RR-6-T01N-SFW and ISCO-RR-6-D02N-SFW. The serial dilution results could not be used to assess potential interferences for three/four of the 24 metals analyzed by ICP since 21/20 analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. Table 1.4 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. For samples ISCO-LR-16-T03N/D03N-SFW, ISCO-LR-16-T04N/D04N-SFW, and ISCO-RR-12-T03N/D03N-SFW the analysis of dissolved molybdenum, 25.4 µg/L, 25.2 µg/L, and 3.1 µg/L respectively, exceeded that of the total analysis, 7.1 µg/L, 10.1 µg/L, and 1.9µg/L respectively, beyond variation expected due to the accuracy limitations of the method. Therefore, the results were qualified as estimated UJ/J TvP-I.
Field QC • Field Duplicate ISCO-RR-12-T03D-SFW ISCO-RR-12-T04D-SFW • Rinsate Blank • Field Blank • Trip Blank	N/A	The field duplicate results presented in this data package satisfied the evaluation criteria. The field QC results for Storm Event #1 will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	N/A	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	NA	
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (N) (mg/L)	Nitrite (mg/L)
ISCO-RR-6-T02N-SFW	0.47 J	0.0050 UJ
ISCO-RR-6-T03N-SFW	0.44 J	0.0050 UJ
ISCO-RR-6-T04N-SFW	0.49 J	0.0050 UJ
ISCO-RR-6-T01N-SFW	0.52 J	0.0096 J
ISCO-RR-12-T03N-SFW	0.53 J	0.0074 J
ISCO-RR-12-T03D-SFW	0.49 J	0.0076 J
ISCO-RR-12-T04N-SFW	0.51 J	0.0071 J
ISCO-LR-16-T03N-SFW	0.43 J	0.0050 UJ
ISCO-LR-16-T04N-SFW	0.40 UJ	0.0050 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P)	21.4	---	19.2	49.0	---	18.3	ISCO-LR-16-D03N-SFW ISCO-RR-12-D03N-SFW ISCO-RR-12-D04N-SFW ISCO-RR-6-D01N-SFW	U CCB-I
Antimony (MS)*	CCB3 5.5	CCB4 5.5	CCB5 5.5	CCB6 5.5	---	0.5	ISCO-LR-16-D04N-SFW ISCO-RR-12-D04N-SFW ISCO-RR-6-D01N-SFW ISCO-RR-6-T02N-SFW ISCO-RR-6-T03N-SFW	U CCB-I
Beryllium (P)	---	0.2	0.4	---	---	0.2	ISCO-LR-16-T04N-SFW ISCO-RR-12-T03N-SFW ISCO-RR-12-T04N-SFW ISCO-RR-6-D04N-SFW ISCO-RR-6-T01N-SFW	U CCB-I
Chromium (P)	---	---	---	---	0.718	0.6	ISCO-LR-16-D03N-SFW ISCO-LR-16-D04N-SFW ISCO-RR-12-D03N-SFW ISCO-RR-12-D04N-SFW ISCO-RR-12-T03N-SFW ISCO-RR-6-D01N-SFW ISCO-RR-6-D03N-SFW	U MB-I
Iron (P)	21.2	19.4	29.5	27.4	---	16.8	ISCO-LR-16-D03N-SFW ISCO-LR-16-D04N-SFW ISCO-RR-12-D03N-SFW ISCO-RR-12-D04N-SFW ISCO-RR-6-D01N-SFW ISCO-RR-6-D02N-SFW ISCO-RR-6-D04N-SFW	U CCB-I
Mercury (CV)	---	---	-0.1	---	0.1	0.1	ISCO-LR-16-D03N-SFW ISCO-LR-16-D04N-SFW ISCO-LR-16-T03N-SFW ISCO-LR-16-T04N-SFW ISCO-RR-6-D01N-SFW ISCO-RR-6-D03N-SFW ISCO-RR-6-D04N-SFW ISCO-RR-6-T01N-SFW ISCO-RR-12-T03N-SFW	UJ MB,CCB-L UJ CCB-L U MB-I

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

*Antimony was not associated with CCB1 and CCB2 results. The results for these blanks were therefore not included.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R or MS/MSD %Rs	PDS %R	Criteria	Comment	Action
ISCO-RR-6-D02N-SFW					
Silver	125.5	79.5	75-125	None	NQ ND w/high bias
ISCO-RR-6-T01N-SFW					
Aluminum	135.6	95.6	75-125	None	J MS-H parent
Silver	128.3	81.0			NQ ND w/high bias

NQ = No Qualification
ND = Non detect

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification
ISCO-RR-6-T01N-SFW		
Arsenic	14.2	J DL-L parent
Molybdenum	22.1	J DL-L parent
ISCO-RR-6-D02N-SFW		
Cadmium	11.0	J DL-L parent
Molybdenum	22.8	UJ DL-L parent

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT156S Sampling Event: Fall 2002

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 10/03/03

Peer Reviewer: Larry Brook Date Completed: 10/14/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD_5	COD
ISCO-RR-12-T01N-SFW	SA	536249		W	X	X		
ISCO-RR-12-D01N-SFW	SA	536250		W	X			
ISCO-RR-12-T01D-SFW	FD	536251		W	X	X		
ISCO-RR-12-T02N-SFW	SA	536252		W	X	X		
ISCO-RR-12-D02N-SFW	SA	536253		W	X			
ISCO-RR-12-D02D-SFW	FD	536254		W	X			
ISCO-LR-16-T01N-SFW	SA	536255		W	X	X		
ISCO-LR-16-D01N-SFW	SA	536256		W	X			
ISCO-LR-16-T02N-SFW	SA	536257		W	X	X		
ISCO-LR-16-D02N-SFW	SA	536258		W	X			
STORM-1-T01N-SFW	SA	536259		W	X	X	X	X
STORM-1-D01N-SFW	SA	536260		W	X			
LOWER REACH GOATHILL-T01N-SFW	SA	536261	LOWREGOAT-T01N-SFW	W	X	X	X	X
LOWER REACH GOATHILL-D01N-SFW	SA	536262	LOWREGOAT-D01N-SFW	W	X			
RB01T-SFW	RB	536263		W	X	X		

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank FB = Field Blank TB = Trip Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues noted in the laboratory case narrative resulting in data qualification are presented below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory log-in sheet notes the BOD_5 and COD analyses for samples STORM-1-T01N-GRW and LOWER REACH GOATHILL-T01N-SFW were not marked on the COC. However, adequate volumes were received for these analyses. These samples were accordingly logged in and run for these analyses. The COC does not list sample ISCO-RR-12-D01D-SFW. It does however list a sample ISCO-12-D02D-SFW with the same sample time as ISCO-RR-12-D02N-SFW, its apparent parent. Upon review of the field collection sheets and field COCs, this was confirmed. Accordingly sample ISCO-RR-12-D01D-SFW was amended to ISCO-RR-12-D02D-SFW. In addition, the lab notes the field duplicates and QC samples were assigned per the ISCO sampling guidelines using the container labels, and not the COC as the reference.
Holding Times	No	As mentioned in the laboratory case narrative, samples ISCO-RR-12-T01N-SFW and ISCO-RR-12-T02N-SFW were received one day beyond the holding time for nitrate as N and nitrite as N. These samples were analyzed for these parameters the day they were received. In addition, the majority of remaining nitrate and nitrite analyses were performed several hours beyond the prescribed analytical holding time of 48 hours, and were accordingly qualified as estimated. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 21 days beyond log-in. The pH for all samples was measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July Storm 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution ISCO-RR-12-T01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The internal standard recovery of ^{89}Y was high for the ICPMS analyses of samples ISCO-LR-16-T01N-SFW and ISCO-LR-16-T02N-SFW. In addition, ^{6}Li reported a low recovery for sample RB01T-SFW. Accordingly, the molybdenum for the first two samples, and the potassium result for the latter sample, as verified by the run-logs, were reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. One serial dilution test was conducted on sample ISCO-RR-12-T01N-SFW. The serial dilution results could not be used to assess potential interferences for 13 of the 24 metals analyzed by ICP as only 11analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. As all percent differences were less than 10%, no qualification of data was necessary on the basis of serial dilution. For samples ISCO-LR-16-T01N/D01N-SFW, ISCO-LR-16-T02N/D02N-SFW, and ISCO-RR-12-T01N/D01N-SFW the analysis of dissolved molybdenum 33.1µg/L, 25.0 µg/L, and 3.2 µg/L respectively, exceeded that of the total analysis, 7.5 µg/L, 6.4 µg/L, and 1.7µg/L respectively, beyond

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		variation expected due to the accuracy limitations of the method. Therefore, the results were qualified as estimated UJ/J TvP-I. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5.
Field QC • Field Duplicate ISCO-RR-12-T01N/T01D-SFW ISCO-RR-12-D02N/D02D-SFW • Rinsate Blank • RB01T-SFW • Field Blank • Trip Blank	Yes	Field duplicates were assessed for overall precision of the analyte and representativeness to the medium. Table 1.3 summarizes field duplicate results outside evaluation criteria the resultant data qualifications. With the exception of TSS and TDS, all results for the rinsate blank sample analyzed with this data package were nondetect. No qualification was issued at this time, as the field QC results for the July Storm 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Cond. (µmhos/cm)	pH (std units)
ISCO-RR-12-T01N-SFW	0.57 J	0.0065 J	---	---
ISCO-RR-12-T02N-SFW	0.46 J	0.0064 J	---	---
ISCO-LR-16-T01N-SFW	0.40 J	0.0050 UJ	---	---
ISCO-LR-16-T02N-SFW	0.41 J	0.0050 UJ	---	---
STORM-1-T01N-SFW	---	---	508 J	7.8 J
LOWER REACH GOATHILL-T01N-SFW	---	---	622 J	7.4 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P)	---	---	---	-23.860	23.6	ISCO-LR-16-D01N-SFW ISCO-LR-16-D02N-SFW ISCO-RR-12-D01D-SFW ISCO-RR-12-D01N-SFW ISCO-RR-12-D02N-SFW LOWREGOAT-D01N-SFW RB01T-SFW STORM1-D01N-SFW	J MB-L UJ MB-L
Antimony (MS)	1.2	1.0	1.0	0.578	0.5	ISCO-LR-16-T02N-SFW ISCO-RR-12-T01N-SFW	U MB,CCB-I
Beryllium (P)	---	0.2	---	---	0.2	LOWREGOAT-T01N-SFW STORM-1-T01N-SFW	U CCM-I
Copper (MS)	---	---	---	3.035	0.9	ISCO-LR-16-D01N-SFW ISCO-LR-16-D02N-SFW ISCO-RR-12-D01D-SFW ISCO-RR-12-D01N-SFW ISCO-RR-12-D02N-SFW LOWREGOAT-D01N-SFW LOWREGOAT-T01N-SFW STORM-1-D01N-SFW	U MB-I
Mercury (CV)	---	---	0.1	0.110	0.1	ISCO-LR-16-T02N-SFW ISCO-RR-12-T01D-SFW ISCO-RR-12-T01N-SFW ISCO-RR-12-T02N-SFW LOWREGOAT-D01N-SFW STORM-1-T01N-SFW	U MB,CCB-I
Zinc (P)	---	---	---	3.555	1.0	ISCO-LR-16-D01N-SFW ISCO-LR-16-D02N-SFW LOWREGOAT-D01N-SFW STORM-1-D01N-SFW	U MB-I

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Field Duplicate Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	CRDL (mg/L)	FD Results		Criteria*	Qualification Code
		ISCO-RR-12-T01N-SFW	ISCO-RR-12-T01D-SFW		
Aluminum	200	4850	2860	51.6 RPD	J FD-I
Iron	100	4540	2710	50.5 RPD	
Manganese	15	630	371	51.7 RPD	
Zinc	20	591	342	53.4 RPD	

*Criteria: 30RPD (when both sample results >5XCRDL), >2xRL (when one or both sample results <5xCRDL) RL = Reporting Limit

MOLYCORP RI/FS DATA VALIDATION REPORT FOR STORM EVENT #2

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004

URS

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140429

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Non-Valid Matrix Spikes 3-1
3.2.2 Laboratory Performance Review (LPR) Findings 3-1

Section 4 Collective Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.1.1 Post-Digestion Spikes 4-3
4.2 Inorganic Laboratory Duplicate Results (Precision Evaluation) 4-3
4.3 ICP Serial Dilution Results 4-4

Section 5 Collective Assessment of Field QC Results 5-1

5.1 Field Duplicate Agreement 5-1
5.2 Rinsate Blank Results 5-2

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-2
6.4 Representativeness 6-2
6.5 Comparability 6-2
6.6 Sensitivity 6-3

TABLE OF CONTENTS

List of Tables

Table 1-1	Summary of Storm Event Surface Water Collected August 13, 2003
Table 4-1	Field Samples Designated for Matrix QC Analysis
Table 4-2	Frequency Requirements for Matrix QC
Table 4-3	Inorganics Matrix Spike Results
Table 4-4	Metals Matrix Spike Results
Table 4-5	Summary of Laboratory Duplicate ISCO Water Sample Exceedances
Table 4-6	ICP Serial Dilution Results
Table 4-7	ICP Serial Dilution Overall Assessment
Table 5-1	Summary of Field Duplicate Samples for Storm Event #2
Table 5-2	Field Duplicate Frequency for Storm Event #2
Table 5-3	Summary of Rinsate Blank Samples Collected for Storm Event #2
Table 5-4	Summary of Rinsate Blank Results and Additional Qualifications
Table 6-1	Summary of Precision Assessment for Storm Event #2
Table 6-2	Summary of Accuracy Assessment for Storm Event #2

List of Attachments

Attachment 1.1	Data Review Summary for Data Package WAT160S
Attachment 1.2	Data Review Summary for Data Package WAT164S
Attachment 1.3	Data Review Summary for Data Package WAT165S

This Data Validation Report (DVR) provides a general overview of the usability of the surface water chemical analytical data obtained August 13, 2003 during the Storm Event #2 at Molycorp Questa Mine in Questa, New Mexico. This report contains the results and process of the sample specific data reviews and collective evaluations for the surface water samples collected by the ISCO autosamplers in support of the Remedial Investigation/Feasibility Study (RI/FS).

The storm water samples were submitted to Severn Trent Laboratories (STL) Burlington in Colchester, Vermont for chemical analysis. The number of samples collected and analyses conducted were accordance with the RI/FS Quality Assurance Project Plan, Appendix A – Field Sampling Plan, Automatic Samplers on the Red River – Field Sampling Plan, dated March 14, 2003. The analytical results were reported in four packages.

Table 1-1 summarizes the ISCO surface water samples collected by the autosamplers, along with the analyses performed on each sample and the accompanying QC samples.

Table 1-1
Summary of Storm Event Surface Water Samples Collected on August 13, 2003

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganics
ISCO-RR-6-T01N-SFW (WAT164S)	X, MS, LD	X	X
ISCO-RR-6-T02N-SFW (WAT164S)	X, MS, LD	X	X
ISCO-RR-6-T03N-SFW (WAT164S)	X	X	X, MS, LD[2]
ISCO-RR-6-T04N-SFW (WAT164S)	X	X	X, MS, LD[3]
ISCO-RR-8-T01N-SFW (WAT164S)	X	X	X
ISCO-RR-8-T02N-SFW (WAT164S)	X	X	X, LD[4]
ISCO-RR-8-T03N-SFW (WAT164S)	X	X	X
ISCO-RR-8-T04N-SFW (WAT164S)	X	X	X
ISCO-RR-12-T01N-SFW (WAT165S)	X, FD	X	X
ISCO-RR-12-T02N-SFW (WAT165S)	X	X, FD	X
ISCO-RR-12-T03N-SFW (WAT165S)	X	X	X, FD[5]
ISCO-RR-12-T04N-SFW (WAT165S)	X	X	X, FD[6]
ISCO-RR-15-T01N-SFW (WAT165S)	X	X	X
ISCO-RR-15-T02N-SFW (WAT165S)	X	X	X
ISCO-RR-15-T03N-SFW (WAT165S)	X	X	X
ISCO-RR-15-T04N-SFW (WAT164S)	X	X	X
ISCO-LR-16-T01N-SFW (WAT160S)	X	X	X
ISCO-LR-16-T02N-SFW (WAT160S)	X	X	X
ISCO-LR-16-T03N-SFW (WAT160S)	X	X	X
ISCO-LR-16-T04N-SFW (WAT164S)	X	X	X
Number of samples	20	20	20
Number of sets of MS/LD	2	0	1 full set + 1 extra TSS
Number of sets of Field Duplicates	1	1	1
Number Rinsate Blanks	1	1	1

MS = Matrix Spike LD = Laboratory Duplicate FD = Field Duplicate RB = Rinsate Blank

[1] The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

[2] MS and LD for chloride, nitrate, fluoride, nitrite, and alkalinity; LD for TDS also.

[3] MS and LD for sulfate.

[4] LD for TSS only; in addition to the planned and requested QC.

[5] Field duplicate for all inorganics except TSS.

[6] Field duplicate for TSS only.

The data review process evaluated sample-specific and laboratory performance criteria in accordance with the standard operating procedure (SOP) 12.1. As mentioned in the SOP, all RI/FS data generated for the Questa Mine received an evaluation of sample-specific parameters. In addition, 10% of the data packages (per analysis type per event/episode) were reviewed for laboratory performance parameters. The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Sample-specific reviews evaluated the following sample related parameters:

- Case narrative comments
- Chain-of-Custody/Sample Receipt
- Holding Times
- Method Blank (Preparation Blank)
- Matrix-Dependent Quality Control
  - Matrix Spike Analysis
  - Laboratory Duplicate Analysis
- Method-Specific Quality Control Measures
  - Inorganic Method Specific QC Measures
    - Post Digestion Spike Analysis
    - ICP Serial Dilution Tests
    - Internal Standard Performance
    - Cation/Anion Balance Evaluation
- Total vs. Partial Balance
- Field Quality Control Samples
  - Field Duplicate Agreement
  - Rinsate Blank Results

Evaluation of laboratory performance parameters provided an overall representation of the analytical system at the time the samples were analyzed. The laboratory performance review evaluated parameters in control of the laboratory, but independent of the field samples analyzed, as follows:

- Interference Check Standard
- Initial Calibration
- Continuing Calibration Verification
- Laboratory Control Sample Analysis
- Compound Identification
- Target Analyte Quantification
- Verification

- Method Specific Quality Control Check

If any potential systematic problems were determined upon review of the laboratory performance parameters in the selected packages evaluated (meeting the 10% criteria), the review parameter was evaluated in the other Storm Event #2 data packages to determine the need for data qualification. Instances, in which professional judgment was exercised in evaluating the need for data qualification, the basis for this rationale was provided in the data review summary.

Upon completion of the sample-specific reviews and laboratory performance reviews, a collective assessment for the event was performed. Site-specific matrix spike, laboratory duplicate, serial dilution, and field QC samples, rinsate blanks and field duplicate results, were assessed collectively by matrix per event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered more representative of the site sample matrix and a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 3.0 describes sample specific data review findings and several data quality issues affecting all of the sediment packages. Section 4.0 presents the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Section 5.0 summarizes the collective summary of the field QC results (field and rinsate blanks, when applicable, and field duplicate results) and the resultant sample qualification. Lastly, an overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for data packages WAT160S, WAT164S and WAT165S for a total of three original data packages. In order to attain the frequency requirements for laboratory performance reviews, one data package, WAT164S, was evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were identified which globally affected all relevant Storm Event #2 samples analyzed for the Storm Event #2 sampling event**.** Although most of the issues have been addressed in the individual summary reports, these common issues and conclusions are summarized below.

3.2.1 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.2 Laboratory Performance Review (LPR) Findings

As mentioned previously, one data package was given a full validation to assess the performance of the laboratory for all analyses. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. It was not necessary to evaluate any laboratory performance parameters in either of the two remaining data packages.

Inorganic parameter matrix QC consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. The site-specific matrix QC results were assessed collectively for the Storm Event #2 to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.3 present the collective matrix QC results associated with the samples in this event and the resultant data qualifiers.

Four surface water samples were designated for total metals, dissolved metals, and inorganics matrix spike analyses. Table 4-2 summarizes the breakdown of frequency requirements for each of the analyses for Storm Event #2.

Table 4-1
Field Samples Designated for Matrix QC Analysis

Sample ID	Analyses		
	Total Metals	Dissolved Metals	Inorganics
ISCO-RR-6-T01N-SFW (WAT164S)	X		
ISCO-RR-6-T02N-SFW (WAT164S)	X		
ISCO-RR-6-T03N-SFW (WAT164S)			X
ISCO-RR-6-T04N-SFW (WAT164S)			X

Table 4-2
Frequency Requirements for Matrix QC

Analyses	# MS Samples	Total # Samples	Percentage (%)
Total Metals	2	20	10%
Dissolved Metals	0	20	0%
Inorganics	1	20	5%

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied total metals and inorganics (unfiltered samples). While the plan was to submit additional volume of sample ISCO-RR-6-D02N-SFW for matrix QC (“D02N”), the field personnel recognized prior to sample shipping that the QC volume for the “D02N” sample was inadvertently not filtered. As the volume had already been transferred to an acidified bottle, the QC volume was therefore representative of the “T02N” sample, rather than the “D02N” sample. While the QC frequency was not met for dissolved metals, pooling the dissolved metals and total metals into the general category of “metals” results in a QC frequency of 5% (2 per 20 samples). The lack of a matrix spike analysis on a dissolved metals sample is not considered to affect the usability of the dissolved metals data.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results. In general, qualification was limited to the parent sample if fewer than a quarter of the applicable matrix spike recoveries were outside the acceptance range. Conversely, if more than a quarter of the applicable matrix spike recoveries were outside the acceptance range, data qualification may have been extended to the remainder of the data set for

the event. However, the data reviewer also took other factors into consideration such as the average matrix spike recovery, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

A number of MS recoveries were outside of the acceptance limits of 75-125% for metals. Tables 4-4 and 4-5 summarize the inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 4-3
Inorganics Matrix Spike Results

Analyte	Number of Valid Spikes/ Total Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
Chloride	1 of 1	0	**1**	132.1	J MS-H for positive results NQ for nondetect results
Nitrate as N	1 of 1	0	0	93.9	None
Total Alkalinity	1 of 1	0	0	99.8	None
Fluoride	1 of 1	0	0	101.9	None
Sulfate	1 of 1	**1**	0	65.8	J/UJ MS-L to all samples

NQ = No Qualification for a nondetect with a high bias

As the percent recoveries for chloride and sulfate were outside the acceptance range, qualification for these analyte results was extended to all ISCO samples collected during Storm Event #2.

Table 4-4
Metals Matrix Spike Results

Analyte	Total				Action
	# Valid	%R <75%	%R > 125%	Avg %R	
Aluminum	2	0	**1**	161.5	J MS-H for positive total fraction results NQ for nondetect results
Antimony	2	**1**	0	70.4	J/UJ MS-L to all total fraction samples
Arsenic	2	**1**	0	73.7	J/UJ MS-L to all total fraction samples
Barium	2	0	0	101.1	None
Beryllium	2	0	0	104.3	None
Boron	2	0	0	107.0	None
Cadmium	2	0	0	90.3	None
Chromium	2	0	0	106.7	None
Cobalt	2	0	0	105.5	None
Copper	2	0	0	92.5	None
Iron	2	0	0	104.3	None
Lead	2	0	**1**	166.8	J MS-H for positive total fraction results NQ for nondetect results
Manganese	2	0	0	105.0	None
Mercury	2	0	0	104.4	None
Molybdenum	2	0	0	88.3	None
Selenium	2	**1**	0	77.4	J MS-L parent sample only
Nickel	2	0	0	95.0	None

Table 4-4
Metals Matrix Spike Results

Analyte	Total				Action
	# Valid	%R <75%	%R > 125%	Avg %R	
Thallium	2	0	0	103.1	None
Silver	2	0	0	103.6	None
Vanadium	2	**1**	0	84.6	J MS-L parent sample only
Zinc	2	0	0	102.4	None

NQ = No Qualification for a nondetect with a high bias

Selenium and vanadium results were qualified for the parent samples only, as the single outages were marginal and the average percent recoveries were well within the acceptance range. Qualification for aluminum, antimony, arsenic, and lead results was extended to all ISCO surface water samples in Storm Event #2, because the outages were a bit more than marginal and resulted in average recoveries which were outside the 75-125% acceptance range. As no data required rejection, the accuracy of the analyses relative to the site-specific matrix is considered to be acceptable.

4.1.1 Post-Digestion Spikes

Post-digestion spikes were conducted on all ICP and ICP/MS analytes to determine whether matrix recoveries outside of the acceptance range were the result of sample matrix, or due to a bias in the analytical system. All post digestion recoveries for those analytes recovered outside of the acceptance range were reviewed and recovered within the range of 75-125%. Therefore, no qualification of data was assigned for any of the metal analytes on the basis of post-digestion spike recovery, as it was likely that all matrix spike exceedances were due to a matrix effect on digestion rather than a bias in the analytical system.

4.2 INORGANIC LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Laboratory duplicate sample results were evaluated to assess the precision of the laboratory analyses. Five ISCO surface water samples were designated for metals and inorganic parameters laboratory duplicate analysis. The evaluation criteria used are summarized in SOP 12.1. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

As noted in Tables 4-1 and 4-2, there were two laboratory duplicate analyses for total metal, none for dissolved metals, and one duplicate result for each inorganic analyte except TSS for which there were two laboratory duplicate results. With relatively few exceptions, the RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within the QAPP acceptance limits. Table 4-5 summarizes the laboratory duplicate results which exhibited disagreements in concentrations resulting in the data qualification in the parent sample results.

Table 4-5
Summary of Laboratory Duplicate ISCO Water Sample Exceedances

Analyte	Sample ID	Criterion	Criterion Exceedances	Action
Arsenic	ISCO-RR-6-T01N-SFW	|Diff| <1xRL	AD = 1.35 x CRDL	J D-I parent sample only
Lead	ISCO-RR-6-T01N-SFW	RPD≤20%	RPD = 22%	J/UJ D-I to all total fraction samples
	ISCO-RR-6-T02N-SFW	|Diff| <1xRL	AD = 4.9 x CRDL	
Vanadium	ISCO-RR-6-T01N-SFW	RPD≤20%	RPD = 23%	
	ISCO-RR-6-T02N-SFW	|Diff| <1xRL	RPD = 1.2 x CRDL	

Evaluation Criteria: RPD ≤ 20% if both results are ≥ 5x CRDL
AD ≤ 1 xRL if either result is < 5x CRDL
CRDL = Contract Required Detection Limit
RPD = Relative Percent Difference
AD = Absolute difference between results

For arsenic, qualification was limited to the parent sample because one of the two duplicate results was only slightly out. However, all sample results for lead and vanadium were qualified as estimated, as both of the laboratory duplicate results did not meet the criteria for laboratory duplicate agreement. No qualification of inorganic data was necessary on the basis of laboratory duplicate results. The overall level of analytical precision demonstrated is considered to be acceptable.

4.3 ICP SERIAL DILUTION RESULTS

ICP serial dilutions were performed on metal samples in every data package. These analyses were run on the same samples as were designated for matrix QC analyses, or otherwise randomly selected in data packages in which there were no QC samples designated. These analyses were used to evaluate whether or not significant physical or chemical interferences existed due to sample matrix. This was accomplished by analyzing the sample and a five-fold dilution of the sample. The two results are compared by means of a percent difference (%D). When analyte concentrations are sufficiently high (50x the dilution adjusted IDL or greater), the two results should show good agreement (i.e. %D≤10%) in the absence of matrix interferences. Otherwise, the presence of potential interference resulting in signal depression or enhancement may be suspected.

Table 4-6 summarizes each sample utilized for a serial dilution analysis, along with the analytes for which sample concentrations were >50xIDL, and the results exceeding the acceptance criterion of ≤10%D.

Table 4-6
ICP Serial Dilution Results

Sample ID	Applicable Analytes (%D>10% in bold)
ISCO-RR-6-T01N-SFW (WAT164S)	Al, Sb, **As (10.8%),** Ba, Be, B, **Cd (17.5%),** Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, **Mo (19.2),** Ni, Tl, Ag, V, Zn
ISCO-RR-6-T02N-SFW (WAT164S)	Al, Sb, **As (14.3%),** Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mn, Mo, Ni, Tl, Ag, V, Zn
ISCO-RR-12-T01N-SFW (WAT165S)	Ca, Mn, **Zn (11.5%)**

Table 4-7 summarizes the average % Ds for each of the analytes, along with the percent of applicable analytes that exceeded control criteria (10%) and the resultant qualifiers issued based on the collective assessment. Where exceedances were identified, the diluted result is generally considered more accurate as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result.

Qualifications were generally limited to the parent samples if less than a quarter of the valid serial dilution results were outside of the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set, the average %D, and the magnitude of outages were also taken into consideration. For this event, evaluation of the serial dilution results collectively did not result in any additional qualification of results. The analysis was considered to be in control and did not indicate a pervasive matrix analytical problem.

Table 4-7
ICP Serial Dilution Overall Assessment

Analyte	Total				Action
	# of Valid Results	%Ds >10%	% Valid Result >10%	Average %D	
Aluminum	2	0	0%	3.2	None
Antimony	2	0	0%	5.8	None
Arsenic	2	**2**	100%	12.6	J/UJ DL-L to all total fraction samples
Barium	2	0	0%	2.7	None
Beryllium	2	0	0%	3.7	None
Boron	2	0	0%	4.0	None
Cadmium	2	**1**	50%	9.9	J DL-L to parent sample only
Calcium	3	0	0%	2.0	None
Chromium	2	0	0%	3.1	None
Cobalt	2	0	0%	2.6	None
Copper	2	0	0%	4.4	None
Iron	2	0	0%	2.5	None
Lead	2	0	0%	1.9	None
Magnesium	1	0	0%	0.5	None
Manganese	3	0	0%	2.3	None
Molybdenum	2	**1**	50%	12.8	J/UJ DL-L to all total fraction samples
Nickel	2	0	0%	2.9	None
Potassium	0	---	---	---	None
Selenium	0	---	---	---	None
Silver	2	0	0%	4.1	None
Sodium	0	---	---	---	None
Thalli um	2	0	0%	0.0	None
Vanadium	2	0	0%	0.7	None
Zinc	3	**1**	33.3%	7.2	J DL-L to parent sample only

--- = Not Applicable serial dilution results

Five serial dilution results were in excess of 10%. Only the parent samples were qualified for both cadmium and zinc due to the single outage and average %Ds below 10%. Qualification for arsenic and molybdenum was extended to all total fraction results in Storm Event #2, as the

average %Ds were in excess of 10%. Although some results were qualified on the basis of serial dilution results, the results obtained are not considered indicative of significant matrix analytical problems for the metals analyses.

Site-specific field duplicate samples and rinsate blanks were assessed collectively by matrix for Storm Event #2 to determine the need for qualification of sample results of similar matrices. The sections to follow summarize the results for these QC samples and any collective qualifications arising from the assessments.

5.1 FIELD DUPLICATE AGREEMENT

The field duplicate agreement assessment evaluated the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the field conditions. Results of field duplicate sample analyses were evaluated using the following concentration-dependent evaluation criteria specified in the QAPP. When both concentration results were sufficiently greater (5x) the RL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤30%. If one or both of the concentration results were less than 5x the RL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤2x the RL.

Table 5-1 summarizes the sample sites, which were duplicated and notated as field duplicate samples, per parameter. The breakdown of field duplicate pair samples per analysis and fraction can be referenced in Table 5-2.

Table 5-1
Summary of Field Duplicate Samples for Storm Event #2

Sample ID	Analyses		
	Total Metals	Dissolved Metals	Inorganics
ISCO-RR-12-T01N/T01D-SFW (WAT164S)	X	---	---
ISCO-RR-12-D02N/D02D-SFW (WAT164S)	---	X	---
ISCO-RR-12-T03N/T03D-SFW (WAT164S)	---	---	X [1]
ISCO-RR-12-T04N/T04D-SFW (WAT164S)	---	---	X [2]

[1] Field duplicate for all inorganics except TSS.

[2] Field duplicate for TSS only.

Table 5-2
Field Duplicate Frequency for Storm Event #2

Analyses	Number of FD Samples	Total Samples	Percentage (%)
Total Metals	1	20	5.0%
Dissolved Metals	1	20	5.0%
Inorganics	1	20	5.0%

All field duplicate sample results for Storm Event #2 were within the criteria specified in SOP 12.1, with the exception of the iron results for field duplicate sample pair ISCO-RR-T01N/T01D-SFW. These results are summarized in data package WAT164S; only the parent sample results were qualified. It was not necessary to qualify any other results in this event for field duplicate imbalances. Based on the FD results, the overall level of precision demonstrated is considered to be acceptable.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. The rinsate blanks were prepared by pouring ASTM Type II water into decontaminated ISCO sample collection bottles and then pouring the water directly into sample containers. Table 5-3 summarizes the rinsate blank samples associated with the samples collected during Storm Event #2. The QAPP required frequency of 5% for the collection of rinsate blanks was met for Storm Event #2.

Table 5-3
Summary of Rinsate Blank Samples Collected for Storm Event #2

Sample ID	Metals	Inorganics
RB01T-SFW-081403 (WAT165S)	X	X
Frequency:	5%	5%

Table 5-4 summarizes the analytes detected in the associated rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 5-4
Summary of Rinsate Blank Results and Additional Qualifications

Analytes	Conc. (mg/l)	RL	Frequency of Detection	Average Conc. (mg/L)	Range for Field Samples (mg/L)	Action
Bicarbonate Alkalinity	2.8	1	1 of 1	2.8	26.6-76.2	No qualification necessary because all field samples results were >14 mg/l.
Total Alkalinity	2.8	1	1 of 1	2.8	26.6-76.2	

As none of the results were qualified as nondetect on the basis of rinsate blank detections, the rinsate blank results are considered indicative of acceptable decontamination procedures.

All data were considered acceptable for use in meeting project objectives as qualified. Multiple sample results were qualified as nondetect on the basis of contamination identified in the laboratory blank. Others were qualified as estimated on the basis of matrix spike recoveries. Lastly, several data results were qualified as estimated on the basis of holding time exceedances, serial dilution results, or total vs. partial disagreements. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment for Storm Event #2

Analysis Type	QC Measure	# of Analytes Measured	# Within Criteria	% Results within Criteria
Inorganics	FD	15	15	100%
	LD	16	16	100%
Total metals	FD	42	41	97.6%
	LD	42	37	88.1%

The percentage of acceptable precision measurements ranged from 88.1 to 100% for all parameters. The overall level of precision demonstrated for all analyses collectively was considered to be acceptable.

6.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Percent of MS recoveries meeting criteria are summarized in Table 6-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters.

Table 6-2
Summary of Accuracy Assessment for Storm Event #2

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
Inorganics	MS	6	4	66.7%
Metals	MS	42	36	85.7%

The percentage of acceptable accuracy measurements ranged from 66.7 to 85.7%. The overall level of accuracy with respect to the site matrix demonstrated for all analyses collectively was considered to be acceptable.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results were considered usable as qualified for meeting project objectives. As such, a percentage of 100% was calculated to represent the completeness of ISCO surface water samples, which satisfied the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the Storm Event #2. As only iron results for one field duplicate pair were qualified on the basis of field duplicate disagreement, the samples collected are considered adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 5.2 indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample

preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analytes. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. While it is anticipated that all non-rejected data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT160S

Sampling Event: August 2003 SFW and Storm Event #2

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Karen Kronoveter

Date Completed: 10/03/03

Peer Reviewer: Stacey Coker

Date Completed: 11/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
RR-US-SPRING39-T01N-SFW	SA	537611	RR-US-SPRG39-T01N-SF RR-US-SPRG39-T01N-SFW	W	X	X	X	X
RR-US-SPRING39-D01N-SFW	SA	537612	RR-US-SPRG39-D01N-SF RR-US-SPRG39-D01N-SFW	W	X			
RB01T-SFW	RB	537613		W	X	X	X	X
RR-US-SPRING13-T01N-SFW	SA	537614	RR-US-SPRG13-T01N-SF RR-US-SPRG13-T01N-SFW	W	X	X	X	X
RR-US-SPRING13-D01N-SFW	SA	537615	RR-USSPRG13-D01N-SF RR-USSPRG-13-D01N-SFW	W	X			
RR-DS-SPRING39-T01N-SFW	SA	537616	RR-DS-SPRG39-T01N-SF RR-DS-SPRG39-T01N-SFW	W	X	X	X	X
RR-DS-SPRING39-D01N-SFW	SA	537617	RR-DS-SPRG39-D01NSF RR-DS-SPRG39-D01NSFW	W	X			
RR-DS-SPRING13-T01N-SFW	SA	537618	RR-DS-SPRG13-T01N-SF RR-DS-SPRG13-T01N-SFW	W	X	X	X	X
RR-DS-SPRING13-D01N-SFW	SA	537619	RR-DS-SPRG13-D01N-SF RR-DS-SPRG13-D01N-SFW	W	X			
RR-DS-SPRING13-T01D-SFW	FD	537620	RR-DS-SPRG13-T01D-SF RR-DS-SPRG13-T01D-SFW	W	X	X	X	X
RR-DS-SPRING13-D01D-SFW	FD	537621	RR-DS-SPRG13-D01D-SF RR-DS-SPRG13-D01D-SFW	W	X			
ISCO-LR-16-T01N-SFW	SA	538090		W	X	X		
ISCO-LR-16-D01N-SFW	SA	538091		W	X			
ISCO-LR-16-T02N-SFW	SA	538092		W	X	X		
ISCO-LR-16-D02N-SFW	SA	538093		W	X			
ISCO-LR-16-T03N-SFW	SA	538094		W	X	X		
ISCO-LR-16-D03N-SFW	SA	538095		W	X			

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted the original Total Dissolved Solids (TDS) analyses of all samples in this delivery group, performed within the prescribed analytical holding time of 7 days, resulted in net weights after drying that were in excess of the upper limit of the method (160.1). Upon review of the raw data sheets, it was verified that only sample RR-DS-SPRING39-T01N-SFW yielded a net weight in excess of the method specified weight limit. Accordingly, only this sample was reanalyzed, using a reduced sample volume. The reanalyzed reported TDS result was comparable with the original TDS result.

In addition, the laboratory case narrative noted samples RR-DS-SPRING39-T01N-SFW, RR-DS-SPRING13-T01N-SFW, and RR-DS-SPRING13-T01D-SFW were received two days after their collection, within hours of the expiration of the 48 hour holding time for nitrate (in addition to nitrite, orthophosphate, and BOD_5). The nitrate sequence for these samples was initiated the day they were received, however the auto-sampler did not inject them until after midnight, thereby recording the nitrate analysis date as 08/14/03. Regardless, all nitrate results for samples collected on 08/11/03 and presented with this data package were qualified as estimated (J/UJ), as summarized in the table.

The case narrative presented by the laboratory commented on the elevated replicate percent difference for TOC (22%). However, due to the fact that neither TOC concentration was in excess of the reporting limit, the difference between the two reported concentrations was compared to an evaluation criterion of ≤ 1xRL. Accordingly, no qualification was necessary on the basis of laboratory duplicate results.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As mentioned in the case narrative summary, the TDS result for sample RR-DS-SPRING39-T01N-SFW was qualified as estimated (J), as the reported result was analyzed 15 days beyond the prescribed analytical holding time of 7 days. The majority of nitrate, nitrite, orthophosphate, and BOD_5 analyses were performed several hours beyond the prescribed analytical holding time of 48 hours, and were accordingly qualified as estimated. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 21 days beyond log-in. The pH for all samples was measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		According to the logbooks and field data sheets, al ISCO-LR-16 samples were collected on 08-13-03. A collection date of 08-14-03 was erroneously recorded on the COC form. The collection date was corrected in the database.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD RR-US-SPRING13-T01N-SFW RR-US-SPRING13-D01N-SFW • LD RR-US-SPRING13-T01N-SFW RR-US-SPRING13-D01N-SFW	No	Total Alkalinity, sulfate, COD and TOC were recovered outside the acceptance limits of 75-125% in the matrix spike analysis of sample RR-US-SPRING13-T01N-SFW. Table 1.3 summarizes the matrix spike detections along with the qualifications assigned to the parent sample. The matrix quality control results for the August 2003 SFW and Storm Event #2 will be evaluated collectively and any resultant data qualification will be summarized in the individual overall assessments for these two events.
Method QC • Surrogates • Serial Dilution (C) RR-US-SPRING13-T01N-SFW RR-US-SPRING13-D01N-SFW • Total vs. Partial Analyses	No	Two serial dilution tests were conducted on matrix spike samples RR-US-SPRING13-T01N-SFW and RR-US-SPRING13-D01N-SFW. The serial dilution results could not be used to assess potential interferences for four of the 24 metals analyzed by ICP since 20 analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. Table 1.4 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The molybdenum concentration of 38.3 µg/L in the filtrate (dissolved) sample ISCO-LR-16-D01N-SFW was greater than the molybdenum concentration of 53.1 µg/L in the corresponding total metals sample, ISCO-LR1-6-T01N-SFW. Due to the fact that both values are greater than 5x the RL (run at a straight analysis), the percent difference between the two results is compared to an evaluation criterion of 30%. The partial concentration is 64.7 % greater than the total concentration. Accordingly, the molybdenum results for both samples were qualified as estimated (J) with an indeterminate direction of bias.
Field QC • Field Duplicate RR-DS-SPRING13-T01N/T01D-SFW RR-DS-SPRING13-D01D/D01N-SFW • Rinsate Blank RB01T-SFW • Field Blank • Trip Blank	No	The iron results for samples RR-DS-SPRING13-T01D-SFW and RR-DS-SPRING13-D01D-SFW were qualified as estimated due to field duplicate disagreement. Table 1.5 summarizes the detections and resultant qualifications. The field QC results for the August 2003 SFW and Storm Event #2 will be evaluated collectively and any resultant data qualification will be summarized in the individual overall assessments for these events.
Nondetect Results w/ Elevated RLs?	N/A	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (N) (mg/L)	Nitrite (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)	BOD_5 (mg/L)	TDS (mg/L)
RR-DS-SPRING39-T01N-SFW	0.55 J	0.0050 UJ	0.10 UJ	313 J	6.3 J	1.4 UJ	---
RB01T-SFW	0.20 UJ	0.0050 UJ	---	0.11 J	5.7 J	1.4 UJ	---
RR-US-SPRING13-T01N-SFW	0.36 J	0.0050 UJ	0.010 UJ	328 J	7.5 J	1.4 UJ	---
RR-DS-SPRING39-T01N-SFW	0.35 J	0.0050 UJ	0.010 UJ	313 J	7.5 J	1.4 UJ	290 J
RR-DS-SPRING13-T01N-SFW	0.39 J	0.0050 UJ	0.010 UJ	332 J	7.5 J	1.4 UJ	---
RR-DS-SPRING13-T01D-SFW	0.38 J	0.0050 UJ	0.010 UJ	334 J	7.5 J	1.4 UJ	---
ISCO-LR-16-T01N-SFW	---	---	---	410 J	8.1 J	---	---
ISCO-LR-16-T02N-SFW	---	---	---	411 J	8.0 J	---	---
ISCO-LR-16-T03N-SFW	---	---	---	415 J	8.0 J	---	---

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Chromium (P)	-2.1	-2.2	-2.2	-2.0	-2.070		All samples	UJ MB,CCB-L
Mercury (CV)	-0.1	---	---	---	---	0.1	ISCO-LR-16-D01N-SFW ISCO-LR-16-D02N-SFW ISCO-LR-16-D03N-SFW ISCO-LR-16-T01N-SFW ISCO-LR-16-T02N-SFW ISCO-LR-16-T03N-SFW	UJ CCB-L
Molybdenum (MS)	0.5	---	---	---	---	0.3	RR-US-SPRING13-T01N-SFW RR-US-SPRING39-D01N-SFW RR-US-SPRING39-T01N-SFW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

*CCB1 and CCB2 results were not associated with any of the samples analyzed in this data package and were therefore not included in this table.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R or MS/MSD %Rs	PDS %R	Criteria	Action
RR-US-SPRING13-T01N-SFW				
Total Alkalinity	141.9	N/A	75-125	J MS-H parent
Sulfate	51.5			J MS-L parent
Chemical Oxygen Demand	58.8			J MS-L parent
Total Organic Carbon	65.0			J MS-L parent

NA = Not appropriate FD = Field Duplicate

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification
RR-US-SPRING13-T01N-SFW		
Cadmium	10.7	J DL-L parent
Nickel	15.6	J DL-L parent
RR-US-SPRING13-D01N-SFW		
Arsenic	16.2	UJ DL-L parent

Table 1.5
Field Duplicate Concentrations Resulting in Qualification

Sample	Original Iron (µg/L)	Duplicate Iron (µg/L)	Qualification Code
8.5	452	860	J FD-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT164S

Sampling Event: Storm Event #2, August 2003

Matrix: Solid ___ Water X Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter

Date Completed: 10/09/03

Peer Reviewer: Stacey Coker

Date Completed: 11/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
ISCO-RR-6-T01N-SFW	SA	538123	W	X[2]	X
ISCO-RR-6-D01N-SFW	SA	538124	W	X	
ISCO-RR-6-T02N-SFW	SA	538125	W	X[2]	X
ISCO-RR-6-D02N-SFW	SA	538126	W	X	
ISCO-RR-6-T03N-SFW	SA	538127	W	X	X[2]
ISCO-RR-6-D03N-SFW	SA	538128	W	X	
ISCO-RR-6-T04N-SFW	SA	538129	W	X	X[2]
ISCO-RR-6-D04N-SFW	SA	538130	W	X	
ISCO-RR-8-T01N-SFW	SA	538131	W	X	X
ISCO-RR-8-D01N-SFW	SA	538132	W	X	
ISCO-RR-8-T02N-SFW	SA	538133	W	X	X
ISCO-RR-8-D02N-SFW	SA	538134	W	X	
ISCO-RR-8-T03N-SFW	SA	538135	W	X	X
ISCO-RR-8-D03N-SFW	SA	538136	W	X	
ISCO-RR-8-T04N-SFW	SA	538137	W	X	X
ISCO-RR-8-D04N-SFW	SA	538138	W	X	
ISCO-RR-15-T04N-SFW	SA	538139	W	X	X
ISCO-RR-15-D04N-SFW	SA	538140	W	X	
ISCO-RR-16-T04N-SFW	SA	538141	W	X	X
ISCO-RR-16-D04N-SFW	SA	538142	W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Additional volume submitted for matrix QC analyses.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted anion/cation balances were not calculated for the samples in this data package, as not all of the constituents to the calculation were analyzed.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	According to the laboratory log-in sheet, limited sample volumes were supplied for samples ISCO-RR-6-T03N-SFW and ISCO-RR-6-T04N-SFW. Accordingly, the laboratory split the W-6 bottle (i.e. inorganics) for each of these samples to provide adequate volumes for QC analyses. This did not adversely affect the quality or usability of the data.
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 23 days beyond log-in. The pH for all samples was measured approximately four hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/D ISCO-RR-6-T01N-SFW ISCO-RR-6-T02N-SFW ISCO-RR-6-T03N-SFW ISCO-RR-6-T04N-SFW • LD ISCO-RR-6-T01N-SFW ISCO-RR-6-T02N-SFW ISCO-RR-6-T03N-SFW ISCO-RR-6-T04N-SFW ISCO-RR-8-T02N-SFW	No	Additional aliquots of the samples listed to the left were submitted for matrix QC analyses. While the intention was to send additional volume of the filtered sample (i.e. W-2 bottle) at the second time interval, hence a "D02N" sample, the bottle was inadvertently not filtered. As such, the matrix QC for the second time interval was done on the total metals fraction rather than the dissolved metals fraction. Various inorganic analytes were recovered outside the accepted recovery range of 75-125% in the matrix spike analyses of the samples listed to the left. Table 1.3 summarizes the matrix spike recoveries outside the acceptance range along with the qualifications assigned to the parent sample results. The laboratory case narrative noted the laboratory duplicate analysis associated with sample ISCO-RR-6-D01N-SFW resulted in Relative Percent Differences (RPDs) in excess of the control criteria (20%) for lead and vanadium. Upon review of the laboratory duplicate forms (#6), it was determined that this was the incorrect sample. Laboratory duplicate analyses for metals were performed on samples ISCO-RR-6-T01N-SFW and ISCO-RR-6-T02N-SFW. The duplicate analysis of sample ISCO-RR-6-T01N-SFW reported RPDs for lead and vanadium in excess of control criteria. Arsenic, lead, and vanadium reported RPDs in excess of control criteria for the duplicate analysis of sample ISCO-RR-6-T02N-SFW. Table 1.4 summarizes the laboratory duplicate results outside the evaluation criteria and resultant data qualification. The matrix quality control results for Storm Event #2 will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (C) ISCO-RR-6-T01N-SFWSL ISCO-RR-6-T02N-SFWSL • Total vs. Partial Analyses	No	The internal standard recoveries of ^{89}Y, ^{115}In, ^{159}Tb, and ^{209}Bi were high for the ICPMS analysis of sample ISCO-RR-8-D03N-SFW. Accordingly, Mo and Ba results for this sample, as verified by the run-logs, were reported form the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. As, Cd, Cu, Pb, Ni, and Tl were reported off of the original straight ICP-MS analysis on 09/24/03. Detected results (Cu and Ni) were qualified as estimated (J) with a indeterminate bias direction. Nondetect results (As, Cd, Pb, and Tl) for this sample were qualified as estimated (UJ). Two serial dilution tests were conducted on matrix spike samples ISCO RR-6-T01N-SFWS and ISCO-RR-6-T02N-SFWS. The serial dilution results could not be used to assess potential interferences for two/four of the 24 metals analyzed by ICP since 22/20 analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. Table 1.5 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. A few metal results for three samples were qualified on the basis of partial vs. total disagreements. Table 1.6 summarizes these samples, along with the reported concentrations and qualifications assigned.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No field QC samples were analyzed with the data in this package. The field QC results for the Storm Event #2 will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	N/A	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.
Laboratory Performance Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	The high standard of nitrate dropped on some ICALs, however all samples were within the range of the calibration curve.
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	Information regarding the mass resolution is not available due to software limitations. However, acceptable mass resolution can be inferred from the other QC sample results which satisfied evaluation criteria.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (N) (mg/L)	Nitrite (mg/L)	Cond. (µmhos/cm)	pH (std units)
ISCO-RR-6-T01N-SFW	---	0.0050 J	264 J	7.5 J
ISCO-RR-6-T02N-SFW	---	---	263 J	7.7 J
ISCO-RR-6-T03N-SFW	---	---	257 J	7.9 J
ISCO-RR-6-T04N-SFW	---	---	249 J	7.9 J
ISCO-RR-8-T01N-SFW	---	---	247 J	8.1 J
ISCO-RR-8-T02N-SFW	---	---	292 J	7.6 J
ISCO-RR-8-T03N-SFW	---	---	267 J	7.8 J
ISCO-RR-8-T04N-SFW	0.38 J	---	258 J	8.0 J
ISCO-RR-15-T04N-SFW	---	---	319 J	7.6 J
ISCO-LR-16-T04N-SFW	---	0.0050 UJ	379 J	7.9 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P)	---	---	27.1	24.3	35.4	24.19	18.3	ISCO-LR-16-D04N-SFW ISCO-RR-15-D04N-SFW ISCO-RR-6-D01N-SFW ISCO-RR-6-T01N-SFW ISCO-RR-8-D02N-SFW	U MB,CCB-I U MB-I
Antimony (MS)	0.7	0.8	1.1	1.0	1.2	---	0.5	ISCO-RR-6-D02N-SFW ISCO-RR-6-T01N-SFW	U CCB-I
Beryllium (P)	---	---	---	---	---	-0.456	0.2	All samples	J MB-L UJ MB-L
Iron (P)	---	---	---	---	---	17.47	16.8	ISCO-RR-15-D04N-SFW ISCO-RR-6-D03N-SFW ISCO-RR-8-D02N-SFW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

*CCB1 and CCB2 results were not associated with any of the samples analyzed in this data package and were therefore not included in this table.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R or MS/MSD %Rs	PDS %R	Criteria	Action
ISCO-RR-6-T01N-SFW				
Antimony	50.4	89.2	75-125%	J MS-L
Arsenic	57.9	83.0		
Selenium	73.4	70.1		
Vanadium	67.8	95.0		
ISCO-RR-6-T02N-SFW				
Lead	230[1]	102.2	75-125%	J MS-I[2]
ISCO-RR-6-T03N-SFW				
Chloride	132	N/A	75-125%	J MS-H
ISCO-RR-6-T04N-SFW				
Sulfate	65.8	N/A	75-125%	J MS-L

[1]MS %R = 156% if laboratory duplicate result is used.

[2]Difficult to assess bias direction with certainty due to the disagreement between the original sample and the laboratory duplicate result; therefore a bias direction of indeterminate was assigned.

Table 1.4
Laboratory Duplicate Results Outside Evaluation Criteria
And Resultant Data Qualification

Sample	Analyte	CRDL (µg/L)	Original Result (µg/L)	Duplicate Result (µg/L)	Criteria	Qualification Code
ISCO-RR-6-T01N-SFW	Arsenic	2.0	10.1	7.41	1.35 x CRDL	J D-I
	Lead	3.0	102	81.8	22%	
	Vanadium	4.0	22.1	17.6	23%	
ISCO-RR-6-T02N-SFW	Lead	3.0	13.7	28.4	4.9 x CRDL	
	Vandium	4.0	1.48	6.22	1.2 x CRDL	

Evaluation Criteria: RPD ≤ 20% if both results are ≥ 5x CRDL — RPD = Relative Percent Difference
AD ≤ 1 xRL if either result is < 5x CRDL — AD = Absolute difference between results
CRDL = Contract Required Detection Limit

Table 1.5
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Code
ISCO-RR-6-T02N-SFW		
Arsenic	14.3	J DL-L
ISCO-RR-6-T01N-SFW		
Arsenic	10.8	J DL-L
Cadmium	17.5	
Molybdenum	19.2	

Table 1.6
Total vs. Partial Concentrations Resulting in Qualification

Sample	Analyte	Total Concentration (µg/L)	Dissolved Concentration (µg/L)	RL (µg/L)	Criteria	Qualification Code
ISCO-RR-8-T04N/D04N-SFW	Copper	15.0	31.1	0.9	>30%	J TvP-I
	Manganese	246	539	0.7		
	Zinc	47.8	98.8	5.7		

Evaluation Criteria: RL = Instrument Detection Limit (IDL) x Dilution Factor (DF)

%D ≤ 30% if both results are > 5x RL %D = percent difference (calculated as [dissolved-total]/dissolved x100%)

AD ≤ 2x RL if either result is < 5x RL AD = Absolute Difference

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT165S Sampling Event: Storm Event #2, August 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 10/06/03

Peer Reviewer: Stacey Coker Date Completed: 11/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
ISCO-RR-12-T01N-SFW	SA	538176	W	X	X
ISCO-RR-12-D01N-SFW	SA	538177	W	X	
ISCO-RR-12-T01D-SFW	FD	538178	W	X	
ISCO-RR-12-T02N-SFW	SA	538179	W	X	X
ISCO-RR-12-D02N-SFW	SA	538180	W	X	
ISCO-RR-12-D02D-SFW	FD	538181	W	X	
ISCO-RR-12-T03N-SFW	SA	538182	W	X	X
ISCO-RR-12-D03N-SFW	SA	538183	W	X	
ISCO-RR-12-T03D-SFW	FD	538184	W	X	X[2]
ISCO-RR-12-T04N-SFW	SA	538185	W	X	X
ISCO-RR-12-D04N-SFW	SA	538186	W	X	
ISCO-RR-12-T04D-SFW	FD	538187	W	X	X[3]
ISCO-RR-15-T01N-SFW	SA	538188	W	X	X
ISCO-RR-15-D01N-SFW	SA	538189	W	X	
ISCO-RR-15-T02N-SFW	SA	538190	W	X	X
ISCO-RR-15-D02N-SFW	SA	538191	W	X	
ISCO-RR-15-T03N-SFW	SA	538192	W	X	X
ISCO-RR-15-D03N-SFW	SA	538193	W	X	
RB01T-SFW	RB	538194 538194A*	W	X	X
RB01T-SOL	RB	538195	W	X	X

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]W-6 modified Inorganics

[3]TSS only

*This data package included two different laboratory IDs for the same Rinsate Blank sample.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the laboratory case narrative are addressed in the relevant sections in the table.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As mentioned in the laboratory case narrative, the Total Organic Carbon (TOC) analysis of sample RB01T-SOL was performed five days beyond the prescribed analytical holding time of 28 days, due to an instrument malfunction. The nature of this malfunction was not discernable from the raw data sheets or the summary data package. The TOC result for this sample was accordingly qualified as estimated. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 26 days beyond log-in. The pH for all samples was measured approximately four hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS • MS/MSD • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July Storm #1 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) ISCO-RR-12-T01N-SFW • Total vs. Partial Analyses	No	One serial dilution test was conducted on sample ISCO-RR-12-T01N-SFW. The serial dilution results could not be used to assess potential interferences for 21of the 24 metals analyzed by ICP since only three analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. The percent difference for zinc was 11.5%, thereby resulting in the qualification of this analyte in the parent sample as estimated (J), with a low bias direction assigned. The internal standard recovery of ^{89}Y was high for the ICPMS analyses of samples ISCO-RR-15-T01N-SFW. Accordingly, the molybdenum for this sample, as verified by the run-logs, was reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The reported TDS result of 38.0 mg/L for sample RB01T-SFW does not agree with the calculated TDS result of 6 mg/L (which is mostly attributable to detection limits for nondetect results). As such, the result was qualified as unusable (R TvP-H). For samples ISCO-RR-15-T01N/D01N-SFW and ISCO-RR-15-T03N-D03N-SFW the analysis of dissolved molybdenum, 2.8 µg/L and 2.6 µg/L, exceeded that of the total analysis, 1.7µg/L for both samples, beyond variation expected due to the accuracy limitations of the method. Therefore, the results were qualified as estimated UJ/J TvP-I.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate ISCO-RR-12-T01N/T01D-SFW ISCO-RR-12-D02N/D02D-SFW ISCO-RR-12-T03N/T03D-SFW ISCO-RR-12-T04N/T04D-SFW • Rinsate Blank RB01T-SFW RB01T-SOL • Field Blank • Trip Blank	N/A	The iron results for samples ISCO-RR-12-T01D-SFWand ISCO-RR-12-T01N-GRW were qualified as estimated due to field duplicate disagreement. Table 1.3 summarizes the detections and resultant qualifications. With the exception of TDS, bicarbonate alkalinity, and total alkalinity, all results for the rinsate blank samples analyzed with this data package were nondetect. The field QC results for the July Storm #1 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	N/A	The only instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The sample summary form provided by the laboratory lists four separate rinsate blank samples (all RB01T- three for SFW and one for SOL), with separate laboratory ids assigned. Upon review of the chain of custody, it was noted that only two rinsate blank samples were sampled (RB01T-SFW, RB01T-SOL) and sent to the laboratory. Accordingly, results for rinsate blank samples RB01T-SFW (538194A) and RB01T-SOL (538195) were reported.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	TOC (mg/L)	Cond. (µmhos/cm)	pH (std units)
ISCO-RR-12-T01N-SFW	---	279 J	7.9 J
ISCO-RR-12-T02N-SFW	---	279 J	7.9 J
ISCO-RR-12-T03N-SFW	---	307 J	7.8 J
ISCO-RR-12-T03D-SFW	---	306 J	7.8 J
ISCO-RR-12-T04N-SFW	---	304 J	7.7 J
ISCO-RR-15-T01N-SFW	---	292 J	7.8 J
ISCO-RR-15-T02N-SFW	---	299 J	7.5 J
ISCO-RR-15-T03N-SFW	---	314 J	7.8 J
RB01T-SFW	---	0.00 J	6.7 J
RB01T-SOL	1.0 UJ	0.00 J	5.5 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS)	0.8/ 2.8	0.7/ 2.5	0.7	0.9	---	0.5	ISCO-RR-12-T01N-SFW RB01T-SOL	U CCB-I
Molybdenum (MS)	0.6	---	---	---	---	0.3	ISCO-RR-12-D01N-SFW ISCO-RR-12-D02D-SFW ISCO-RR-12-T01D-SFW ISCO-RR-12-T01N-SFW ISCO-RR-12-T02N-SFW	U CCB-I
Zinc (P)	---	---	---	---	1.998	1.6	RB01T-SOL	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Field Duplicate Concentrations Resulting in Qualification

Sample	Original Concentration (µg/L)	Duplicate Concentration (µg/L)	CRDL (µg/L)	Criteria	Qualification Codes
ISCO-RR-12-T01D/T01N-SFW	1220	604	100	RPD >30%	J FD-I

Evaluation Criteria: RPD ≤30% if both results are ≥ 5x CRDL; AD ≤ 2xRL if either result is <5x CRDL; CRDL = Contract Required Detection Limit

RPD = Relative Percent Difference
AD = Absolute difference between results

MOLYCORP RI/FS
DATA VALIDATION REPORT
FOR
STORM EVENTS #3, #4, AND #5

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004

URS

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140463

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Non-Valid Matrix Spikes 3-1
3.2.2 Laboratory Performance Review (LPR) Findings 3-1

Section 4 Collective Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.2 Inorganic Laboratory Duplicate Results (Precision Evaluation) 4-3
4.3 ICP Serial Dilution Results 4-4

Section 5 Collective Assessment of Field QC Results 5-1

5.1 Field Duplicate Agreement 5-1
5.2 Rinsate Blank Results 5-2

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-2
6.4 Representativeness 6-2
6.5 Comparability 6-2
6.6 Sensitivity 6-3

TABLE OF CONTENTS

List of Tables

Table 1-1 Summary of Surface Water Samples Autosampled September 3, 5, and 10, 2003

Table 4-1 Field Samples Designated for Matrix QC Analysis

Table 4-2 Frequency Requirements for Matrix QC

Table 4-3 Inorganics Matrix Spike Results

Table 4-4 Metals Matrix Spike Results

Table 4-5 ICP Serial Dilution Results

Table 4-6 ICP Serial Dilution Overall Assessment

Table 5-1 Summary of Field Duplicate Samples for Storm Event #3,4,5

Table 5-2 Field Duplicate Collection Frequency for Storm Event #3,4,5

Table 5-3 Summary of Field Duplicate Storm Event Water Sample Exceedances

Table 5-4 Summary of Rinsate Blank Samples Collected Fall 2003

Table 5-5 Summary of Rinsate Blank Results and Additional Qualifications

Table 6-1 Summary of Precision Assessment for Storm Event #3,4,5

Table 6-2 Summary of Accuracy Assessment for Storm Event #3,4,5

Attachments

Attachment 1.1 Data Review Summary for Data Package WAT166S

Attachment 1.2 Data Review Summary for Data Package WAT167S

Attachment 1.3 Data Review Summary for Data Package WAT168S

Attachment 1.4 Data Review Summary for Data Package WAT175S

This Data Validation Report (DVR) provides a general overview of the usability of the storm surface water chemical analytical data obtained September 3, (Storm #3), September 5-6 (Storm #4), and September 10 (Storm #5), 2003 during the Storm Events at Molycorp Questa Mine in Questa, New Mexico. The overall evaluation was done on these three storm events collectively, as they occurred within the same week period. This report contains the results and process of the sample specific data reviews and collective evaluations for the surface water samples collected by the ISCO autosamplers in support of the Remedial Investigation/Feasibility Study (RI/FS).

The storm water samples were submitted to Severn Trent Laboratories (STL) Burlington in Colchester, Vermont for chemical analysis. The number of samples collected and analyses conducted were accordance with the RI/FS Quality Assurance Project Plan, Appendix A – Field Sampling Plan, Automatic Samplers on the Red River – Field Sampling Plan, dated March 14, 2003. The analytical results were reported in four packages.

Table 1-1 summarizes the ISCO surface water samples collected by the autosamplers during these storm events, along with the analyses performed on each sample and the accompanying QC samples.

Table 1-1
Summary of Storm Event Surface Water Samples collected on September 3, 5, and 10, 2003

Sample Identification (SDG)1	Storm Event	Total Metals	Dissolved Metals	Inorganics
ISCO-RR-6-T01N-SFW (WAT166S)	Event #3 September 3	X, MS, LD	X	X
ISCO-RR-6-T02N-SFW (WAT166S)		X	X, MS, LD	X
ISCO-RR-6-T03N-SFW (WAT166S)		X	X	X, MS, LD 2
ISCO-RR-6-T04N-SFW (WAT166S)		X	X	X, MS, LD 3
ISCO-RR-8-T01N-SFW (WAT166S)		X	X	X
ISCO-RR-8-T02N-SFW (WAT166S)		X	X	X
ISCO-RR-8-T03N-SFW (WAT166S)		X	X	
ISCO-RR-8-T04N-SFW (WAT166S)		X	X	X
ISCO-RR-12-T01N-SFW (WAT166S)		X,FD	X	X
ISCO-RR-12-T02N-SFW (WAT166S)		X	X, FD	X
ISCO-RR-12-T03N-SFW (WAT166S)		X	X	X, FD
ISCO-RR-12-T04N-SFW (WAT166S)		X	X	X, FD
ISCO-RR-6-T01N-SFW (WAT167S)	Event #4 September 5 & 6	X, MS, LD	X	X
ISCO-RR-6-T02N-SFW (WAT167S)		X	X, MS, LD	X
ISCO-RR-6-T03N-SFW (WAT167S)		X	X	X, MS, LD 4
ISCO-RR-6-T04N-SFW (WAT165S)		X	X	X, MS, LD 5
ISCO-RR-8-T01N-SFW (WAT168S)		X	X	X
ISCO-RR-8-T02N-SFW (WAT168S)		X	X	X
ISCO-RR-8-T03N-SFW (WAT168S)		X	X	X
ISCO-RR-8-T04N-SFW (WAT168S)		X	X	X
ISCO-RR-12-T01N-SFW (WAT168S)		X,FD	X	X
ISCO-RR-12-T02N-SFW (WAT168S)		X	X, FD	X
ISCO-RR-12-T03N-SFW (WAT168S)		X	X	X, FD
ISCO-RR-12-T04N-SFW (WAT168S)		X	X	X, FD
ISCO-RR-15-T01N-SFW (WAT168S)		X	X	X
ISCO-RR-15-T02N-SFW (WAT168S)		X	X	X
ISCO-RR-15-T03N-SFW (WAT168S)		X	X	X
ISCO-RR-15-T04N-SFW (WAT167S)		X	X	X

Sample Identification (SDG)1	Storm Event	Total Metals	Dissolved Metals	Inorganics
ISCO-LR-16-T01N-SFW (WAT167S)	Event #4 September 5 & 6 (cont.)	X	X	X
ISCO-LR-16-T02N-SFW (WAT167S)		X	X	X
ISCO-LR-16-T03N-SFW (WAT167S)		X	X	X
ISCO-LR-16-T04N-SFW (WAT167S)		X	X	X
ISCO-RR-6-T01N-SFW (WAT175S)	Event #5 September 10	X, MS, LD	X	X
ISCO-RR-6-T02N-SFW (WAT175S)		X	X, MS, LD	X
ISCO-RR-6-T03N-SFW (WAT175S)		X	X	X 6
ISCO-RR-6-T04N-SFW (WAT175S)		X	X	X, MS, LD 7
Number of samples		36	36	36
Number MS/LD		3	3	3 sets, except for TSS
Number Field Duplicates		2	2	2
Number Rinsate Blanks		3	3	3

MS = Matrix Spike LD = Laboratory Duplicate FD = Field Duplicate RB = Rinsate Blank

[1] The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

[2] MS and LD for chloride, nitrate, nitrite, and sulfate.

[3] MS and LD for fluoride; LD for TDS and TSS.

[4] MS and LD for chloride, nitrate, and nitrite.

[5] MS and LD for fluoride and sulfate; LD for TDS (an LCSD was analyzed for TSS).

[6] Additional bottle for QC volume, if collected, was not sent to the laboratory.

[5] MS and LD for chloride, nitrate, nitrite, fluoride and sulfate; LD for TDS (an LCSD was analyzed for TSS).

The data review process evaluated sample-specific and laboratory performance criteria in accordance with the standard operating procedure (SOP) 12.1. As mentioned in the SOP, all RI/FS data generated for the Questa Mine received an evaluation of sample-specific parameters. In addition, 10% of the data packages (per analysis type per event/episode) were reviewed for laboratory performance parameters. The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Sample-specific reviews evaluated the following sample related parameters:

- Case narrative comments
- Chain-of-Custody/Sample Receipt
- Holding Times
- Method Blank (Preparation Blank)
- Matrix-Dependent Quality Control
  - Matrix Spike Analysis
  - Laboratory Duplicate Analysis
- Method-Specific Quality Control Measures
  - Inorganic Method Specific QC Measures
    - Post Digestion Spike Analysis
    - ICP Serial Dilution Tests
    - Internal Standard Performance
    - Cation/Anion Balance Evaluation
- Total vs Partial Balance
- Field quality control samples
  - Field Duplicate Agreement
  - Rinsate Blank Results

Evaluation of laboratory performance parameters provided an overall representation of the analytical system at the time the samples were analyzed. The laboratory performance review evaluated parameters in control of the laboratory, but independent of the field samples analyzed, as follows:

- Interference Check Standard
- Initial Calibration
- Continuing Calibration Verification
- Laboratory Control Sample Analysis
- Compound Identification
- Target Analyte Quantification
- Verification

- Method Specific Quality Control Check

If any potential systematic problems were determined upon review of the laboratory performance parameters in the selected packages evaluated (meeting the 10% criteria), the review parameter was evaluated in the other data packages of Storm Events #3, #4, and #5 to determine the need for data qualification. Instances, in which professional judgment was exercised in evaluating the need for data qualification, the basis for this rationale was provided in the data review summary.

Upon completion of the sample-specific reviews and laboratory performance reviews, a collective assessment for the event was performed. Site-specific matrix spike, laboratory duplicate, serial dilution, blank (field and rinsate, when applicable), and field duplicate results were assessed collectively by matrix per event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered more representative of the site sample matrix and a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 3.0 describes sample specific data review findings and several data quality issues affecting all of the sediment packages. Section 4.0 presents the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Section 5.0 summarizes the collective summary of the field QC results (field and rinsate blanks, when applicable, and field duplicate results) and the resultant sample qualification. Lastly, an overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for data packages WAT166S, WAT167S, WAT168S, and WAT175S. In order to attain the frequency requirements for laboratory performance reviews, one data package, WAT175S, was evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were identified which globally affected all relevant Storm Events #3, #4, and #5 samples analyzed for the Storm Events #3, #4, and #5 sampling event**.** Although most of the issues have been addressed in the individual summary reports, these common issues and conclusions are summarized below

3.2.1 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.2 Laboratory Performance Review (LPR) Findings

As mentioned previously, one data package was given a full validation to assess the performance of the laboratory for all analyses. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. It was not necessary to evaluate any laboratory performance parameters in any of the three remaining data packages.

Inorganic parameter matrix QC consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. The site-specific matrix QC results were assessed collectively for the Storm Events #3, #4, and #5 to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.3 present the collective matrix QC results associated with the samples in this event and the resultant data qualifiers.

Due to the nature of sample collection, it was necessary to spread the QC analyses among samples from the four separate sampling intervals within a particular storm event in order to get one full set of QC samples. Four surface water samples were designated for total metals, dissolved metals, and inorganics matrix spike analyses, at varying frequencies. Table 4-2 summarizes the breakdown of frequency requirements for each of the analyses for the Storm Events #3, #4, and #5.

Table 4-1
Field Samples Designated for Matrix QC Analysis

Sample ID	Analyses		
	Total Metals	Dissolved Metals	Inorganics
ISCO-RR-6-T01N-SFW (Events 3, 4, and 5)	3	---	---
ISCO-RR-6-D02N-SFW (Events 3, 4, and 5)	---	3	---
ISCO-RR-6-T03N-SFW (Events 3, and 4)	---	---	2
ISCO-RR-6-T04N-SFW (Events 3, 4, and 5)	---	---	3

The MS for the inorganic analytes were spread out among the third and fourth sampling time (i.e., "T03N" and "T04N" samples). As such, although an additional bottle for "T03N" of storm 5 was not sent, the necessary analyses were obtained from the "T04N" sample.

Table 4-2
Frequency Requirements for Matrix QC

Analyses	# MS Samples	Total # Samples	Percentage (%)
Total Metals	3 sets	36	8.3%
Dissolved Metals	3 sets	36	8.3%
Inorganics	3 sets	36	8.3%

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results.

In general, qualification was limited to the parent sample if less than a quarter of the applicable matrix spike recoveries were outside the acceptance range. Conversely, if more than a quarter of the applicable matrix spike recoveries were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average matrix spike recovery, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

A number of MS recoveries were outside of the acceptance limits of 75-125% for both total and dissolved metals. Tables 4-3 and 4-4 summarize the inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 4-3
Inorganics Matrix Spike Results

Analyte	Number of Valid Spikes/ Total Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
Chloride	3	0	0	101.4	None
Nitrate as N	3	0	0	76.2	None
Fluoride	3	0	0	92.5	None
Sulfate	3	**1**	0	76.2	MS-L to parent sample only
Nitrite as N	3	0	0	100.9	None

As the matrix spike recovery for sulfate was outside of the evaluation criteria for only one of the three matrix spikes, and the average % recovery was acceptable, qualification was limited to the parent sample.

Table 4-4
Metals Matrix Spike Results

Analyte	Total				Dissolved				Action
	# Valid	%R <75%	%R > 125%	Avg %R	# Valid	%R <75%	%R > 125%	Avg %R	
Aluminum	1	0	0	114.0	3	0	0	112.2	None
Antimony	3	**3**	0	25.2	3	0	0	98.5	J/UJ MS-L to all total fraction samples
Arsenic	3	0	0	87.7	3	0	0	87.6	None
Barium	3	0	0	98.4	3	0	0	103.4	None
Beryllium	3	0	0	102.6	3	0	0	107.8	None
Boron	3	0	0	102.9	3	0	0	106.1	None
Cadmium	3	0	0	84.9	3	0	0	88.0	None
Chromium	3	0	0	105.2	3	0	0	108.8	None
Cobalt	3	0	0	100.3	3	0	0	105.5	None
Copper	3	0	0	95.4	3	0	0	100.9	None
Iron	1	0	0	90.0	3	0	0	114.1	None
Lead	2	**1**	**1**	141.3	3	0	0	108.0	J/UJ MS-I to all total fraction samples
Manganese	3	0	0	103.2	3	0	0	107.9	None
Mercury	3	0	0	106.7	3	0	0	101.7	None
Molybdenum	3	**1**	0	86.4	3	0	0	103.2	MS-L to parent sample only
Selenium	3	**1**	0	73.7	3	0	0	82.7	MS-L to parent sample only
Nickel	3	0	0	94.3	3	0	0	98.6	None
Thallium	3	0	0	101.4	3	0	0	108.9	None
Silver	3	0	0	88.3	3	0	0	91.6	None
Vanadium	3	0	0	88.7	3	0	0	103.0	None
Zinc	3	0	0	102.6	3	0	0	108.6	None

NQ (ND) = No Qualification for a nondetect with a high bias

Qualifications for molybdenum and selenium on the basis of matrix spike recoveries were limited to the parent samples. For both analytes, only one of the three matrix spike recoveries was reported outside of the acceptance range. In addition, the average % recoveries were within the evaluation criteria, or only marginally out, as in the case of selenium.

Of the two acceptable matrix spike recoveries for lead, one was reported at 217.8% and the other was reported at 64.8%, the average calculating as 141.3%. These matrix spike recoveries were verified against the raw data. Accordingly, all total fraction results for lead were qualified as estimated with an indeterminate bias direction assigned.

The three matrix spike recoveries for antimony were reported below the acceptance range with recoveries ranging from 7.1% to 37.1%. At project on-set, it was known that the method for digestion for metals was not effective for antimony. As antimony is not considered to be a site-related contaminant, a separate digestion was not considered to be necessary. As such, the low antimony recoveries were not unexpected and the antimony data are considered usable in meeting project objectives in spite of the low bias, with one exception. The antimony result for the parent sample (ISCO-RR-6-T01N-SFW) in data package WAT167S was rejected and is considered unusable due to the 7.1% matrix spike recovery. All other total antimony results were qualified as estimated with a low bias direction assigned.

Post-Digestion Spikes

Post-digestion spikes were conducted on all ICP and ICP/MS analytes to determine whether matrix recoveries outside of the acceptance range were the result of sample matrix, or due to a bias in the analytical system. All post digestion recoveries for those analytes recovered outside of the acceptance range were reviewed and recovered within the range of 75-125%, with the exceptions of one selenium and one molybdenum post digestion spike results. Qualification was limited to the parent samples for selenium and molybdenum on the basis of post-digestion spike recovery. It was likely that matrix spike exceedances were due to a matrix effect on digestion rather than a bias in the analytical system.

4.2 INORGANIC LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Laboratory duplicate sample results were evaluated to assess the precision of the laboratory analyses. Four ISCO surface water samples were designated for metals and inorganic parameters laboratory duplicate analysis. The evaluation criteria used are summarized in SOP 12.1. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

With relatively few exceptions, the RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within the QAPP acceptance limits. Table 4-5 summarizes the laboratory duplicate results for any of the metals or inorganics analytes, which exhibited disagreements in concentrations resulting in the data qualification in the parent samples.

Table 4-5
Summary of Laboratory Duplicate ISCO Water Sample Exceedances

Analyte	Sample ID	Criterion	Criterion Exceedances	Action
Fluoride	ISCO-RR-6-T04N-SFW (WAT175S)	|Diff| <1xRL	AD = 2.2 x RL	J D-I parent samples only
Lead	ISCO-RR-6-T01N-SFW (WAT166S)	RPD≤20%	RPD = 31.8%	
Vanadium	ISCO-RR-6-T01N-SFW (WAT166S)	|Diff| <1xRL	AD = 1.2 x CRDL	

Evaluation Criteria: RPD ≤ 20% if both results are ≥ 5x RL or CRDL
AD ≤ 1 x RL if either result is < 5x RL or CRDL
CRDL = Contract Required Detection Limit
RPD = Relative Percent Difference
AD = Absolute difference between results

In each case, qualifications were limited to the parent samples because the outages were few in number and marginal in magnitude. The overall level of precision demonstrated is considered to be acceptable.

4.3 ICP SERIAL DILUTION RESULTS

ICP serial dilutions were performed on metal samples in every data package. These analyses were run on the same samples as were designated for matrix QC analyses, or otherwise randomly selected in data packages in which there were no QC samples designated. These analyses were used to evaluate whether or not significant physical or chemical interferences existed due to sample matrix. This was accomplished by analyzing the sample and a five-fold dilution of the sample. The percent difference (%D) between these two concentrations was compared for those analytes for which the serial dilution analysis was applicable (i.e., the initial concentrations were sufficiently higher (50x) than the IDL, accounting for dilution).

Table 4-6 summarizes each sample utilized for a serial dilution analysis, along with the associated applicable analytes, and the results exceeding the acceptance criterion of %D ≤ 10%.

Table 4-6
ICP Serial Dilution Results

Sample ID	Applicable Analytes (%D>10% in bold)
TOTAL FRACTION	
ISCO-RR-6-T01N-SFW (WAT166S)	Al, Sb, **As (14.2%),** Ba, Be, B, **Cd (17.7%),** Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, **Se (25.8%),** Ni, Tl, Ag, V, Zn
ISCO-RR-6-T01N-SFW (WAT167S)	Al, Sb, Ba, Be, B, **Cd (19.2),** Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, **Mo (32.0%), K (11.5%),** Tl, Ag, Zn
ISCO-RR-15-T01N-SFW (WAT168S)	**Mo (61.8%),** Ni, **V (13.9%)**
ISCO-RR-8-T04N-SFW (WAT168S)	**Al (13.6), Ba (13.7), Ca (17.1), (Cr (15.9), Co (17.1), Cu (12.1), Fe (12.1), Pb (15.5), Mg (14.4), Mn (16.3), K (20.3), Zn (18.4)**
ISCO-RR-6-T01N-SFW (WAT175S)	Al, Sb, **As (14.1%),** Ba, Be, B, **Cd (18.0%),** Ca, Cr, Co, Cu, Fe, Mn, **Mo (17.3%), Se (32.9%),** Ni Tl, Ag, V, Zn
DISSOLVED FRACTION	
ISCO-RR-6-D02N-SFW (WAT166S)	Al, Sb, As, Ba, Be, B, **Cd (14.2%),** Ca, Cr, Co, Cu, Fe, Mg, Mn, **Se (18.1%),** Ni, Tl, Ag, V, Zn
ISCO-RR-6-D02N-SFW (WAT167S)	Al, Sb, **As (12.6%),** Ba, Be, B, **Cd (11.4%),** Ca, Cr, Co, Cu, Fe, Mg, Mn, Mo, Tl, Ag, Zn
ISCO-RR-6-D02N-SFW (WAT175S)	Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Mn, Mo, Se (17.9%), Ni, Tl, Ag, V, Zn

While Table 4-6 provides a sense of the utility of the serial dilution results by illustrating the number of elements for which sample concentrations were >50 x IDL, Table 4-7 summarizes the average % Ds for each of the analytes, along with the percent of applicable analytes that exceeded control criteria (10%), and the resultant qualifiers based on the collective assessment. Where exceedances were identified, the diluted result is generally considered more accurate as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result.

Qualifications were generally limited to the parent samples if less than a quarter of the valid serial dilution results were outside of the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set and the magnitude of outages were also taken into consideration.

Table 4-7
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	# of Valid Results	%Ds >10%	% Valid Result >10%	Avg %D	# of Valid Results	%Ds >10%	% Valid Result >10%	Avg %D	
Aluminum	4	1	25%	5.4	3	0	0%	2.7	J DL-L to parent sample only
Antimony	2	0	0%	5.2	3	0	0%	5.8	None
Arsenic	3	2	66.7%	11.3	3	1	0%	10.3	J/UJ DL-L to all samples
Barium	4	1	25%	5.8	3	0	0%	2.4	J DL-L to parent sample only
Beryllium	3	0	0%	4.0	3	0	0%	2.2	None
Boron	3	0	0%	4.6	3	0	0%	3.1	None
Cadmium	3	3	100%	**18.3**	3	2	66.7%	11.5	J/UJ DL-L to all samples
Calcium	4	1	25%	6.9	3	0	0%	2.0	J DL-L to parent sample only
Chromium	4	1	25%	6.2	3	0	0%	1.8	J DL-L to parent sample only
Cobalt	4	1	25%	6.9	3	0	0%	1.6	J DL-L to parent sample only
Copper	4	1	25%	6.3	3	0	0%	3.1	J DL-L to parent sample only
Iron	4	1	25%	5.2	3	0	0%	2.7	J DL-L to parent sample only
Lead	3	1	33.3%	8.1	0	---	---	---	J DL-L to parent sample only
Magnesium	3	1	33.3%	7.7	3	0	0%	1.9	J DL-L to parent sample only
Manganese	4	1	25%	6.7	3	0	0%	2.2	J DL-L to parent sample only
Molybdenum	3	3	100%	**37.0**	2	0	0%	4.7	J/UJ DL-L all total fraction samples
Nickel	3	0	0%	4.8	2	0	0%	3.2	None
Potassium	2	2	100%	**15.9**	0	---	---	---	J/UJ DL-L all total fraction samples
Selenium	2	2	100%	**29.4**	3	2	66.7%	**18.0**	J/UJ DL-L all samples
Silver	3	0	0%	6.7	3	0	0%	4.2	None
Sodium	0	---	---	---	0	---	---	---	None
Thallium	3	0	0%	1.6	3	0	0%	1.4	None
Vanadium	3	1	33.3%	7.7	2	0	0%	0.3	J DL-L to parent sample only
Zinc	4	1	25%	9.3	3	0	0%	2.7	J DL-L to parent sample only

As is evident from the table above, several serial dilution results were in excess of 10%. Only the parent sample results were qualified as estimated for aluminum, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, vanadium, and zinc. For each of these metals, only one of the applicable results was out and the average %Ds were <10%. Arsenic, cadmium, and selenium results for both total and dissolved fractions were qualified as estimated for all storm event samples due to frequency of %Ds in excess of 10% and the magnitude of %Ds. For similar reasons, molybdenum and potassium results were qualified as estimated for all storm event samples the total fraction.

Although these results suggest that some matrix interference problems were encountered for a few metals, it is not unexpected considering the nature of the sampling event. The storm event sampling was designed to capture the changes that the Red River may experience during a storm event in which run-off enters the river. During these events, solid material is picked as the rainwater drains into the river. The serial dilution results are likely a function of a temporary increase in solids in the stream.

Site-specific field duplicate samples and rinsate blanks were assessed collectively by matrix for the Storm Events #3, #4, and #5 to evaluate the representativeness of the samples to the medium sampled and to assess overall sampling and analysis precision. The sections to follow summarize the results for these QC samples and any collective qualifications arising from the assessments.

5.1 FIELD DUPLICATE AGREEMENT

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, as follows. When both concentration results were sufficiently greater (5x) the RL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤30%. If one or both of the concentration results were less than 5x the RL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤2x the RL. Again, the frequency of the field duplicate samples followed the frequency of matrix spike and laboratory duplicate analyses, as the same samples were designated for all QC parameters. Table 5-1 summarizes the sample sites, at which field duplicate samples were collected by per parameter. The breakdown of field duplicate pair samples per analysis and fraction is summarized in Table 5-2.

In general, qualification was limited to the parent sample if less than a quarter of the field duplicate results were outside the acceptance range. Conversely, if more than a quarter of the field duplicate results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the magnitude of the exceedances (marginal vs. gross) and the complexity of the sample matrix.

Table 5-1
Summary of Field Duplicate Samples for Storm Events #3, #4, and #5

Sample ID	Analyses		
	Total Metals	Dissolved Metals	Inorganics
ISCO-RR-12-T01N/T01D –SFW (WAT166S)	X	---	---
ISCO-RR-12-D02N/D02D-SFW (WAT166S)	---	X	---
ISCO-RR-12-T03N/T03D-SFW (WAT166S)	---	---	X*
ISCO-RR-12-T04N/T04D-SFW (WAT166S)	---	---	X*
ISCO-RR-12-T01N/T01D-SFW (WAT168S)	X	---	---
ISCO-RR-12-D02N/D02D-SFW (WAT168S)	---	X	---
ISCO-RR-12-T03N/T03D-SFW (WAT168S)	---	---	X*
ISCO-RR-12-T04N/T04D-SFW (WAT168S)	---	---	X*

*Limited inorganics list

Table 5-2
Field Duplicate Collection Frequency for Storm Event #3,4,5

Analyses	Number of FD Samples	Total Samples	Percentage (%)
Total Metals	2	36	5.5%
Dissolved Metals	2	36	5.5%
Inorganics	2	36	5.5%

With the exception of a few metals, all field duplicate samples assessed for the Storm Events #3, #4, and #5 were within the criteria specified in SOP 12.1 for metals and inorganics. Table 5-3 summarized the exceptions and resultant data qualifiers.

Table 5-3
Summary of Field Duplicate Storm Event Water Sample Exceedances

Analyte	Criterion Exceedances	Criterion	Sample ID	Action
Aluminum	RPD = 95.3 %	RPD ≤30%	ISCO-RR-12-T01N/T01D-SFW (WAT166S)	J FD-I for affected field duplicate samples only
Copper	AD = 2.7xRL	≤2xRL		
Iron	RPD = 111.7%	RPD ≤30%		
Lead	RPD = 101.7%			
Manganese	RPD = 87.5%			
Vanadium	AD = 2.1xRL	≤2xRL		
Zinc	RPD = 90.5%	RPD ≤30%		

With few exceptions, the applicable evaluation criterion was met. Qualifications on the basis of field duplicate disagreement were issued to only the parent field duplicate sample pair results for aluminum, copper, iron, lead, manganese, vanadium, and zinc as the frequency of exceedance was minimal. Although some of the exceedances may seem more than marginal, the disparity is likely due to the nature of the sampling program, which was designed to capture a dynamic event. As such, the amount of solids present in two bottles collected sequentially could vary resulting in field duplicate results which do not satisfy the criteria established for evaluating a less dynamic system. Based on the FD results, the overall level of precision demonstrated is considered to be acceptable for all analytes. Additionally, the samples are considered to be representative of the medium sampled.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blanks were collected by pouring ASTM Type II water into decontaminated ISCO sample bottles and the pouring the water into the sample containers.

Table 5-4 summarizes the rinsate blank samples associated with the samples collected during the Storm Events #3, #4, and #5. The QAPP-required frequency of 5% for the collection of rinsate blanks was met for the Storm Events #3, #4, and #5.

Table 5-4
Summary of Rinsate Blank Samples Collected Fall 2003

Sample ID	Metals	Inorganics
RB01T-SFW-090503 (WAT166S)	X	X
RB01T-SFW-090603 (WAT167S)	X	X
Frequency	5.6%	5.6%

Table 5-4 summarizes the analytes detected in the associated storm event rinsate blank samples. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 5-5
Summary of Rinsate Blank Results and Additional Qualifications

Analytes	Frequency of Detections	Average Conc. (mg/L)	RL (mg/l)	Qualification Threshold (mg/L)	Range for Field Samples (mg/L)	Action
Silver	1 of 3	0.4	0.1	2.0	0.1-22	Silver results ≤2.0 were qualified as nondetect.
Total Dissolved Solids	2 of 3	27.7	10	138	138-1060	TDS results ≤ 138 mg/l were qualified as nondetect; one sample result was qualified as nondetect.
Total Suspended Solids	1 of 3	0.78	0.6	3.88	87.7-8370	No Qualification necessary due to range of TSS concentrations in field samples.

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results less than five times the average rinsate blank concentration. Half of the RL was used for nondetects in calculating average rinsate blank concentrations. Despite the fact that some results were qualified as nondetect on the basis of rinsate blank detections, the rinsate blank results are considered to be generally indicative of acceptable decontamination procedures as detections were infrequent and at low levels.

With the exception of a single antimony result, all data were considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of contamination identified in the laboratory blank or rinsate blank. Others were qualified as estimated on the basis of matrix spike recoveries, serial dilution results, holding time exceedances, and field duplicate, laboratory duplicate, or total vs. partial disagreements. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment for Storm Events #3, #4, and #5

Analysis Type	QC Measure	# of Analytes Measured	# Within Criteria	% Results within Criteria
Inorganics	FD	18	18	100%
	LD	23	22	95.7%
Total Metals	FD	42	35	83.3%
	LD	63	61	96.8%
Dissolved Metals	FD	42	42	100%
	LD	63	63	100%

The percentage of acceptable precision measurements ranged from 83.3% to 100% for all parameters. The overall level of precision demonstrated for all analyses collectively was considered to be acceptable.

6.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Percent of MS recoveries meeting criteria are summarized in Table 6-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters.

Table 6-2
Summary of Accuracy Assessment for Storm #3,4,5

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
Inorganics	MS	15	14	93.3%
Metals	MS	121	115	95.0%

The overall level of accuracy with respect to the site matrix demonstrated for all analyses collectively was considered to be acceptable.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

With the exception of a single antimony result, all of the results were considered usable, as qualified, for meeting project objectives. As such, a percentage of 99.9% was calculated to represent the completeness of Storm Event #3, #4, and #5 samples, which satisfied the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the Storm Events #3, #4, and #5. As relatively few results were qualified on the basis of field duplicate disagreement, the samples collected are considered adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 5.2 indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample

preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analytes. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. While it is anticipated that all non-rejected data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT166S

Sampling Event: Storm Event #3, September 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 11/10/03

Peer Reviewer: Stacey Coker

Date Completed: 11/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganic
ISCO-RR-6-T01N-SFW	SA	540119	ISCO-RR6-T01N-SFW	W	X	X
ISCO-RR-6-D01N-SFW	SA	540120	ISCO-RR6-D01N-SFW	W	X	
ISCO-RR-6-T02N-SFW	SA	540121	ISCO-RR6-T02N-SFW	W	X	X
ISCO-RR-6-D02N-SFW	SA	540122	ISCO-RR6-D02N-SFW	W	X	
ISCO-RR-6-T03N-SFW	SA	540123	ISCO-RR6-T03N-SFW	W	X	X
ISCO-RR-6-D03N-SFW	SA	540124	ISCO-RR6-D03N-SFW	W	X	
ISCO-RR-6-T04N-SFW	SA	540125	ISCO-RR6-T04N-SFW	W	X	X
ISCO-RR-6-D04N-SFW	SA	540126	ISCO-RR6-D04N-SFW	W	X	
ISCO-RR-8-T01N-SFW	SA	540127	ISCO-RR8-T01N-SFW	W	X	X
ISCO-RR-8-D01N-SFW	SA	540128	ISCO-RR8-D01N-SFW	W	X	
ISCO-RR-8-T02N-SFW	SA	540129	ISCO-RR8-T02N-SFW	W	X	X[3]
ISCO-RR-8-D02N-SFW	SA	540130	ISCO-RR8-D02N-SFW	W	X	
ISCO-RR-8-T03N-SFW	SA	540131	ISCO-RR8-T03N-SFW	W	X	X
ISCO-RR-8-D03N-SFW	SA	540132	ISCO-RR8-D03N-SFW	W	X	
ISCO-RR-8-T04N-SFW	SA	540133	ISCO-RR8-T04N-SFW	W	X	X
ISCO-RR-8-D04N-SFW	SA	540134	ISCO-RR8-D04N-SFW	W	X	
RB01T-SFW	RB	540135		W	X	X
ISCO-RR-12-T01N-SFW	SA	540136	ISCO-RR12-T01N-SFW	W	X	X
ISCO-RR-12-D01N-SFW	SA	540137	ISCO-RR12-D01N-SFW	W	X	
ISCO-RR-12-T01D-SFW	FD	540138	ISCO-RR12-T01D-SFW	W	X	
ISCO-RR-12-T02N-SFW	SA	540139	ISCO-RR12-T02N-SFW	W	X	X
ISCO-RR-12-D02N-SFW	SA	540140	ISCO-RR12-D02N-SFW	W	X	
ISCO-RR-12-D02D-SFW	FD	540141	ISCO-RR12-D02D-SFW	W	X	
ISCO-RR-12-T03N-SFW	SA	540142	ISCO-RR12-T03N-SFW	W	X	X
ISCO-RR-12-D03N-SFW	SA	540143	ISCO-RR12-D03N-SFW	W	X	
ISCO-RR-12-T03D-SFW	FD	540144	ISCO-RR12-T03D-SFW	W	X	X[4]
ISCO-RR-12-T04N-SFW	SA	540145	ISCO-RR12-T04N-SFW	W	X	X
ISCO-RR-12-D04N-SFW	SA	540146	ISCO-RR12-D04N-SFW	W	X	
ISCO-RR-12-T04D-SFW	FD	540147	ISCO-RR12-T04D-SFW	W	X	X[4]

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

[3]Bottles for modified inorganics analyses (i.e., W-6 and W-8 bottles did not fill).

[4]Selected inorganics

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

Due to the fact that a limited list of inorganic analytes were analyzed, a cation-anion balance would not have been a representative assessment of the data quality and subsequently were not generated.

All other comments submitted with the laboratory case narrative were verified and addressed in the relevant sections in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	According to the COC form, all field IDs were recorded with a dash between the "RR" and numeric portions of the site ID. However, the laboratory omitted these dashes at sample log-in.
Holding Times	No	The laboratory case narrative mentions all samples in this delivery group were received one day beyond the holding time of 48 hours for nitrate as N and nitrite as N. All nitrate and nitrite results were qualified as estimated (J/UJ). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections that resulted in data qualification. Lead and sodium were detected in the method prep and continuing calibration blanks but did not result in data qualification, as the reported concentrations were significantly greater than 5x the blank detections.
Matrix QC • MS/MSD ISCO-RR-6-T01N-SFWMS ISCO-RR-6-D02N-SFWMS ISCO-RR-6-T03N-SFWMS ISCO-RR-6-T04N-SFWMS • PDS • LD ISCO-RR-6-T01N-SFWREP ISCO-RR-6-D02N-SFWREP ISCO-RR-6-T03N-SFWREP ISCO-RR-6-T04N-SFWREP	No	The matrix spike analysis of sample ISCO-RR6-T01N-SFW recovered antimony, lead, and selenium outside the acceptance range of 75-125%, suggesting potential biases in the reporting of these analyte results in samples. Table 1.3 summarizes these analytes along with the associated percent recoveries and the qualification codes assigned to the parent samples. Post digestion spikes were performed on all metal analytes. The post digestion spike recoveries for those analytes that did not meet the specified criterion for the initial matrix spike recoveries were reviewed. Selenium was recovered below the acceptance range in sample ISCO-RR-6-T01N-SFW, suggesting a potential low bias in the reporting of selenium. Accordingly, the selenium result in this sample was qualified as estimated (J), with a low bias, as listed in Table 1.3. Laboratory duplicate analysis results were reviewed to evaluate the precision of the laboratory analyses. The evaluation of sample ISCO-RR6-T01N-SFW for duplicate agreement resulted in the qualification of lead and vanadium as estimated (J), as summarized in Table 1.4.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The matrix quality control results for Storm Event #3 will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) ISCO-RR-6-T01N-SFWL ISCO-RR-6-D02N-SFWL • Total vs. Partial Analyses	No	The internal standard recovery of ^{89}Y was high for the ICPMS analysis of samples ISCO-RR6-T01N-SFW. Accordingly, the molybdenum results, as verified by the run-logs, were reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Serial dilution tests were conducted on matrix spike samples ISCO-RR-6-T01N-SFW and ISCO-RR-6-D02N-SFW. The serial dilution results could not be used to assess potential interferences for 3 of the 24 metals analyzed by ICP for sample ISCO-RR-6-T01N-SFW since 21 analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. For the second sample, 20 of the 24 metal analytes were applicable to the serial dilution study. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. Table 1.5 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued.
Field QC • Field Duplicate ISCO-RR-12-T01N/T01D-SFW ISCO-RR-12-D02N/D02D-SFW • Rinsate Blank RB01T-SFW • Field Blank • Trip Blank	Yes	The field duplicate agreement analysis resulted in the qualification of seven sample results for each of the field duplicate pair ISCO-RR-12-T01N/T01D-SFW, as they fell outside the evaluation criteria. Table 1.6 summarizes these analytes along with the qualification codes assigned. It is suspected that the inhomogeneity between the sample and the field duplicate is likely due to the changing (surging) nature of the storm event and the fact that the bottles were filled sequentially. With the exception of TDS and TSS, all results for the rinsate blank sample analyzed with this data package were nondetect. No qualification was issued at this time, as the field QC results for Storm Event #3 will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)
ISCO-RR6-T01N-SFW	0.33 J	0.0050 UJ
ISCO-RR6-T02N-SFW	0.33 J	0.0050 UJ
ISCO-RR6-T03N-SFW	0.33 J	0.0050 UJ
ISCO-RR6-T04N-SFW	0.38 J	0.0050 UJ
ISCO-RR8-T01N-SFW	0.39 J	0.0050 UJ
ISCO-RR8-T03N-SFW	0.44 J	0.0050 UJ
ISCO-RR8-T04N-SFW	0.37 J	0.0050 UJ
RB01T-SFW	0.20 UJ	0.0050 UJ
ISCO-RR12-T01N-SFW	0.39 J	0.0050 UJ
ISCO-RR12-T02N-SFW	0.38 J	0.0050 UJ
ISCO-RR12-T03N-SFW	0.36 J	0.0050 UJ
ISCO-RR12-T03D-SFW	0.46 J	0.0050 UJ
ISCO-RR12-T04N-SFW	0.35 J	0.0050 UJ

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P)	---	---	---	-25.3	---	-31.14	22.1	ISCO-RR12-D01N-SFW ISCO-RR12-D02D-SFW ISCO-RR12-D02N-SFW ISCO-RR12-D03N-SFW ISCO-RR12-D04N-SFW RB01T-SFW	J CCB-L J MB,CCB-L UJ MB,CCB-L UJ CCB-L
Antimony (MS)	---	---	---	---	---	-0.528	0.5	All samples qualified	UJ MB-L J MB-L
Molybdenum (P)	---	---	-1.3	---	-1.2	---	0.20	ISCO-RR12-D01N-SFW ISCO-RR12-D02D-SFW ISCO-RR12-D02N-SFW ISCO-RR12-D03N-SFW ISCO-RR12-D04N-SFW ISCO-RR12-T01D-SFW ISCO-RR8-D01N-SFW ISCO-RR8-D02N-SFW ISCO-RR8-D03N-SFW ISCO-RR8-D04N-SFW RB01T-SFW	J CCB-L UJ CCB-L

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Qualification Codes
ISCO-RR6-T01N-SFW				
Antimony	31.4	---	75-125%	UJ MS-L
Lead	218[1]	---		J MS-I[2]
Selenium	71.9	71.6		J MS-L

[1] MS %R = 160% if laboratory duplicate result is used.

[2] Difficult to assess bias direction with certainty due to the disagreement with the laboratory duplicate for this sample, therefore bias direction of indeterminate assigned.

Table 1.4
Laboratory Duplicate Results and Parent Sample Qualifications

Analyte	Result (µg/L)	Duplicate (µg/L)	CRDL (µg/L)	Criterion	Qualification Codes
ISCO-RR6-T01N-SFW					
Lead	61.2	84.4	3.0	RPD > 30	J D-I
Vanadium	22.3	17.4	4.0	AD > 1xRL	J D-I

Evaluation Criteria: RPD ≤ 20% if both results are ≥ 5x CRDL — RPD = Relative Percent Difference

AD ≤ 1 xRL if either result is < 5x CRDL — AD = Absolute difference between results

RL = Reporting Limit (CRDL for laboratory duplicate evaluations)

Table 1.5
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
ISCO-RR6-T01N-SFW		
Arsenic	14.2	J DL-L
Cadmium	17.7	
Selenium	25.8	
ISCO-RR6-D02N-SFW		
Cadmium	14.2	J DL-L
Selenium	18.1	

Table 1.6
Field Duplicate Concentrations Resulting in Qualification

Sample	Analyte	Original Concentration (µg/L)	Duplicate Concentration (µg/L)	CRDL (µg/L)	Qualification Codes
ISCO-RR-12-T01N/T01D-SFW	Aluminum	13100	4640	200	J FD-I
	Copper	85.1	31.2	20	
	Iron	18400	5210	100	
	Lead	60.8	19.8	3	
	Manganese	777	304	15	
	Vanadium	12.5	4.1	4	
	Zinc	581	219	20	

Evaluation Criteria: RPD ≤ 25% if both results are ≥ 5x CRDL — RPD = Relative Percent Difference

AD ≤ 2 xRL if either result is < 5x CRDL — AD = Absolute difference between results

RL = Reporting Limit (CRDL for laboratory duplicate evaluations)

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT167S

Sampling Event: Storm Events #4 and #5

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 10/22/03

Peer Reviewer: Stacey Coker

Date Completed: 11/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
ISCO-RR-6-T01N-SFW	SA	540286	W	X[2]	X
ISCO-RR-6-D01N-SFW	SA	544287	W	X	
ISCO-RR-6-T02N-SFW	SA	540288	W	X	X
ISCO-RR-6-D02N-SFW	SA	540289	W	X[2]	
ISCO-RR-6-T03N-SFW	SA	540290	W	X	X[2]
ISCO-RR-6-D03N-SFW	SA	540291	W	X	
ISCO-RR-6-T04N-SFW	SA	540292	W	X	X[2]
ISCO-RR-6-D04N-SFW	SA	540293	W	X	
ISCO-LR-16-T01N-SFW	SA	540294	W	X	X
ISCO-LR-16-D01N-SFW	SA	540295	W	X	
ISCO-LR-16-T02N-SFW	SA	540296	W	X	X
ISCO-LR-16-D02N-SFW	SA	540297	W	X	
ISCO-LR-16-T03N-SFW	SA	540298	W	X	X
ISCO-LR-16-D03N-SFW	SA	540299	W	X	
ISCO-LR-16-T04N-SFW	SA	540300	W	X	X
ISCO-LR-16-D04N-SFW	SA	540301	W	X	
ISCO-RR-15-T04N-SFW	SA	540302	W	X	X
ISCO-RR-15-D04N-SFW	SA	540303	W	X	
RB01T-SFW	RB	540304	W	X	X

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Additional volume submitted for matrix QC

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

Due to the fact that a limited list of inorganic analytes were analyzed, cation-anion balance calculations would not have been a representative assessment of the data quality and subsequently were not generated.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The laboratory case narrative mentions all samples in this delivery group were received one day beyond the holding time for nitrate as N and nitrite as N. Upon review of the sampling dates and log-in date, it was determined that the samples were actually received three to four days beyond sampling. The nitrate and nitrite analyses were performed the day they were received by the laboratory. Due to the stability of both nitrite and nitrate, non detects were qualified as estimated as opposed to rejection. All nitrate and nitrite results were qualified as estimated (J/UJ). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD ISCO-RR-6-T01N-SFWMS ISCO-RR-6-D02N-SFWMS ISCO-RR-6-T03N-SFWMS ISCO-RR-6-T04N-SFWMS • PDS ISCO-RR-6-T01N-SFWMS ISCO-RR-6-D02N-SFWMS • LD ISCO-RR-6-T01N-SFWREP ISCO-RR-6-D02N-SFWREP ISCO-RR-6-T03N-SFWREP ISCO-RR-6-T04N-SFWREP	No	In the matrix spike analysis of sample ISCO-RR-6-T01N-SFW, the analytes antimony, molybdenum, and selenium were recovered below the acceptance range of 75-125%, suggesting a potential low bias in the reporting of these analyte results in samples. Table 1.3 summarizes these analytes along with the associated percent recoveries and the qualification codes assigned to the parent samples. Post digestion spikes were performed on all metal analytes for the samples used for matrix spike analyses. The post digestion spike recoveries for those analytes that did not meet the specified criterion for the initial matrix spike recoveries were reviewed. The molybdenum PDS recovery was below the acceptance range for sample ISCO-RR-6-T01N-SFW, suggesting a potential low bias in the reporting of molybdenum. At this time, the molybdenum result for this sample was qualified as estimated (J), with a low bias, as listed in Table 1.3. The matrix quality control results for Storm Event #4 and #5 will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (A) ISCO-RR-6-T01N-SFW ISCO-RR-6-D02N-SFW • Total vs. Partial Analyses	No	The internal standard recovery of ^{89}Y was high for the ICPMS analyses of samples ISCO-LR-16-T03N-SFW and ISCO-RR-15-T04N-SFW. Accordingly, the molybdenum results, as verified by the run-logs, were reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Two serial dilution tests were conducted on matrix spike samples ISCO-RR-T01N-SFW and ISCO-RR-6-D02N-SFW. The serial dilution results could not be used to assess potential interferences for 4 of the 24 metals analyzed by ICP since 20 analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. Table 1.4 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank RB01T-SFW • Field Blank • Trip Blank	Yes	With the exception of TSS and silver, all results for the rinsate blank sample analyzed with this data package were nondetect. No qualification was issued at this time, as the field QC results for Storm Event #4 and #5 will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results Three samples, ISCO-RR-6-T02N-SFW, ISCO-RR-6-T03N-SFW, and ISCO-RR-6-T04N-SFW reported "on-instrument" concentrations of the interferent element iron in excess of 200,000 µg/L. As such, it was necessary to evaluate the potential biases as a result of interferences. Two analyte results were according qualified as estimated (J/UJ) on the basis of the interference check evaluation. Table 1.5 summarizes the qualifications to the samples along with the qualification codes.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)
ISCO-RR-6-T01N-SFW	0.31 J	0.0050 UJ
ISCO-RR-6-T02N-SFW	0.29 J	0.0050 UJ
ISCO-RR-6-T03N-SFW	0.30 J	0.0094 J
ISCO-RR-6-T04N-SFW	0.43 J	0.0052 J
ISCO-LR-16-T01N-SFW	0.29 J	0.0050 UJ
ISCO-LR-16-T02N-SFW	0.30 J	0.0050 UJ
ISCO-LR-16-T03N-SFW	0.29 J	0.0050 UJ
ISCO-LR-16-T04N-SFW	0.28 J	0.0050 UJ
ISCO-RR-15-T04N-SFW	0.33 J	0.0050 UJ
RB01T-SFW	0.20 UJ	0.0050 UJ

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P)	---	71.6	33.2	---	33.420	30.7	ISCO-LR-16-D01N-SFW ISCO-LR-16-D02N-SFW ISCO-LR-16-D03N-SFW ISCO-LR-16-D04N-SFW	U MB, CCB-I
Antimony (MS)	1.4	4.2	1.4	1.3 CCB5 1.3	---	0.50	ISCO-RR-6-T01N-SFW ISCO-RR-6-T02N-SFW ISCO-RR-6-T03N-SFW ISCO-RR-6-T04N-SFW	U CCB-I
Copper (P)	---	---	---	---	2.107	2.0	ISCO-LR-16-D01N-SFW ISCO-LR-16-D02N-SFW ISCO-LR-16-D03N-SFW ISCO-LR-16-D04N-SFW	U MB-I
Mercury (CV)	---	---	---	0.1	---	0.1	ISCO-LR-16-T03N-SFW ISCO-LR-16-T04N-SFW ISCO-RR-15-T04N-SFW	U CCB-I
Zinc (P)	---	---	---	---	3.703	2.0	ISCO-LR-16-D01N-SFW ISCO-LR-16-D02N-SFW ISCO-LR-16-D03N-SFW ISCO-LR-16-D04N-SFW RB01T-SFW	U MB-I

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Qualification Codes
ISCO-RR-6-T01N-SFW				
Antimony	7.1	92.1	75-125%	R MS-L
Molybdenum	70.2	73.3		J MS, PDS-L
Selenium	74.6	76.0		J MS-L

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification
ISCO-RR-6-T01N-SFW		
Cadmium	19.2	J DL-L parent
Molybdenum	32.0	J DL-L parent
Potassium	11.5	J DL-L parent
ISCO-RR-6-D02N-SFW		
Arsenic	12.6	UJ DL-L parent
Cadmium	11.4	J DL-L parent

Table 1.5
Interference Check Evaluation Resulting in Data Qualification

Sample	Analyte	ICSA/B (µg/L)	IDL (µg/L)	Qualification Codes
ISCO-RR-6-T02N-SFW	Antimony	2.0	0.50	UJ ICS-H
ISCO-RR-6-T04N-SFW	Boron	30.0	6.3	J ICS-H

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT168S Sampling Event: Storm Event #4, September 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 11/11/03

Peer Reviewer: Stacey Coker Date Completed: 11/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
ISCO-RR-15-T01N-SFW	SA	540316	W	X	X
ISCO-RR-15-D01N-SFW	SA	540317	W	X	
ISCO-RR-15-T02N-SFW	SA	540318	W	X	X
ISCO-RR-15-D02N-SFW	SA	540319	W	X	
ISCO-RR-15-T03N-SFW	SA	540320	W	X	X
ISCO-RR-15-D03N-SFW	SA	540321	W	X	
ISCO-RR12-T01N-SFW	SA	540322	W	X	X
ISCO-RR12-D01N-SFW	SA	540323	W	X	
ISCO-RR12-T02N-SFW	SA	540324	W	X	X
ISCO-RR12-D02N-SFW	SA	540325	W	X	
ISCO-RR12-T01D-SFW	FD	540326	W	X	
ISCO-RR12-D02D-SFW	FD	540327	W	X	
ISCO-RR12-T03N-SFW	SA	540328	W	X	X
ISCO-RR12-D03N-SFW	SA	540329	W	X	
ISCO-RR12-T04N-SFW	SA	540330	W	X	X
ISCO-RR12-D04N-SFW	SA	540331	W	X	
ISCO-RR12-T03D-SFW	FD	540332	W		X
ISCO-RR12-T04D-SFW	FD	540333	W		X
ISCO-RR-8-T02N-SFW	SA	540334	W	X	X
ISCO-RR-8-D02N-SFW	SA	540335	W	X	
ISCO-RR-8-T03N-SFW	SA	540336	W	X	X
ISCO-RR-8-D03N-SFW	SA	540337	W	X	
ISCO-RR-8-T04N-SFW	SA	540391	W	X	X
ISCO-RR-8-D04N-SFW	SA	540392	W	X	
ISCO-RR-8-T01N-SFW	SA	540393	W	X	X
ISCO-RR-8-D01N-SFW	SA	540394	W	X	

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

Due to the fact that a limited list of inorganic analytes were analyzed, a cation-anion balance would not have been a representative assessment of the data quality and subsequently were not generated.

All other comments submitted with the laboratory case narrative were verified and addressed in the relevant sections in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The sample collection dates reported by the laboratory for samples ISCO-RR12-T/D03N/D-SFW and ISCO-RR12-T/D04N-SFW were incorrectly identified as 09/08/03. These dates were taken from the COC and not verified with the dates recorded on the bottles, which were correctly labeled with a sample collection date of 09/05/03. This error was not noticed at the time of log-in. No qualification of data was necessary as these issues did not adversely affect the quality of the data.
Holding Times	No	The laboratory case narrative noted all samples in this delivery group were received beyond the analytical holding time of 48 hours for nitrate as N and nitrite as N. The samples were analyzed for nitrate and nitrite the day they were received, several days beyond the analytical holding time expiration. Due to the stability of nitrite, nondetect results were qualified as estimated (UJ). Likewise, nitrate results were qualified as estimated (J) with an indeterminate bias direction. Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for Storm Event #4 will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution ISCO-RR-15-T01N-SFW (B) ISCO-RR-8-T04N-SFW (A) • Total vs. Partial Analyses	No	The internal standard recovery of ^{89}Y was high for the ICPMS analyses of samples ISCO-RR-15-T01N-SFW, ISCO-RR-15-T03N-SFW, ISCO-RR12-T04N-SFW, ISCO-RR-8-T02N-SFW, ISCO-RR-8-D02N-SFW, ISCO-RR-8-T03N-SFW and ISCO-RR-8-T04N-SFW. Accordingly, the molybdenum results, as verified by the run-logs, were reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Two serial dilution analyses were run and presented with the data in this package; one for ICP-MS metals (ISCO-RR-15-T01N-SFW) and the other for ICP metals (ISCO-RR-8-T04N-SFW). The serial dilution analysis on sample ISCO-RR-15-T01N-SFW was not applicable for six of the nine ICP-MS metal analytes, as only three of the initial sample results were sufficiently larger (x50) than the IDL. The serial dilution for the ICP metals, run on sample ISCO-RR-8-T04N-SFW, was applicable for 13 of the 17 metal analytes. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10% in the applicable analytes. Table 1.3 summarizes the serial dilution results outside the evaluation criterion and the resultant data qualification issued.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate ISCO-RR12-T01N/T01D-SFW ISCO-RR12-D02N/D02D-SFW ISCO-RR12-T03N/T03D-SFW ISCO-RR12-T04N/T04D-SFW • Rinsate Blank • Field Blank • Trip Blank	N/A	The field duplicate results were within the acceptance limits for all four sample pairs, with exception of the TSS results in samples ISCO-RR-12-T04N/T04D-SFW. The RPD between the TSS results was 27%, slightly exceeding the acceptance limit of ≤ 25%. As such, the TSS results for the parent samples were qualified as estimated, as summarized in Table 1.4. The field QC results for the Storm 2003 Event #4 will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results Samples ISCO-RR-8-T02N-SFW, ISCO-RR-TO3N-SFW, and ISCO-RR-8-T04N-SFW reported iron, one of the interferent elements, at concentrations greater than 200,000 g/L (the amount present in the ICS solution). It was therefore necessary to evaluate any negative or positive biases in results for these two samples suggest by the ICS A analyses. Accordingly, the boron results for samples ISCO-RR-8-T03N-SFW and ISCO-RR-8-T04N-SFW were qualified as estimated (J) with a qualifier code of "ICS" and bias direction of high.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)
ISCO-RR-15-T01N-SFW	0.30 J	0.0050 UJ
ISCO-RR-15-T02N-SFW	0.26 J	0.0050 UJ
ISCO-RR-15-T03N-SFW	0.30 J	0.0050 UJ
ISCO-RR12-T01N-SFW	0.29 J	0.0050 UJ
ISCO-RR12-T02N-SFW	0.33 J	0.0050 UJ
ISCO-RR12-T03N-SFW	0.30 J	0.0050 UJ
ISCO-RR12-T04N-SFW	0.31 J	0.0050 UJ
ISCO-RR12-T03D-SFW	0.32 J	0.0050 UJ
ISCO-RR-8-T02N-SFW	0.30 J	0.0050 UJ
ISCO-RR-8-T03N-SFW	0.25 J	0.0050 UJ
ISCO-RR-8-T04N-SFW	0.28 J	0.0050 UJ
ISCO-RR-8-T01N-SFW	0.31 J	0.0050 UJ

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS)	1.2	1.1	1.1	1.1	1.1	---	0.5	ISCO-RR-15-T01N-SFW ISCO-RR-8-T04N-SFW	U CCB-I
Iron (P)	---	---	---	34.8	44.4	---	30.0	ISCO-RR12-D02D-SFW ISCO-RR12-D02N-SFW ISCO-RR12-D03N-SFW ISCO-RR-8-D03N-SFW	U CCB-I
Zinc (P)	-2.6	-2.3	-2.1	---	-2.0	---	2.0	ISCO-RR-8-D01N-SFW	UJ CCB-L

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
ISCO-RR-15-T01N-SFW		
Molybdenum	61.8	J DL-L
ISCO-RR-8-T04N-SFW		
Aluminum	13.6	J DL-L
Barium	13.7	
Calcium	17.1	
Chromium	15.9	
Cobalt	17.1	
Copper	12.1	
Iron	12.1	
Lead	15.5	
Magnesium	14.4	
Manganese	16.3	
Potassium	20.3	
Vanadium	13.9	
Zinc	18.4	

Table 1.4
Field Duplicate Results Resulting in Data Qualification

Field Duplicate Pair	Analyte	Parent Results (mg/L)	Duplicate Results (mg/L)	RPD	RL (mg/L)	Qualification Codes
ISCO-RR-12-T04N/T04D-SFW	TSS	2170	2850	27%	25	J FD-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT175S

Sampling Event: September 2003 SFW Storm Event #5

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter

Date Completed: 11/18/03

Peer Reviewer: Stacey Coker

Date Completed: 11/18/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
LOWERREACHGOATHILL2-T01N-SFW	SA	541069	LOWREGOAT2-T01N-SFW	W	X	X		
LOWERREACHHOATHILL2-D01N-SFW	SA	541070	LOWREGOAT2-D01N-SFW	W	X			
GHGC-T01N-SFW	SA	541071		W	X	X		
GHGC-D01N-SFW	SA	541072		W	X			
STORM1-T01N-SFW	SA	541073		W	X	X	X	X
STORM1-D01N-SFW	SA	541074		W	X			
ISCO-RR-6-T01N-SFW	SA	541075		W	X[3]	X		
ISCO-RR-6-D01N-SFW	SA	541076		W	X			
ISCO-RR-6-T02N-SFW	SA	541077		W	X	X		
ISCO-RR-6-D02N-SFW	SA	541078		W	X[3]			
ISCO-RR-6-T03N-SFW	SA	541079		W	X	X		
ISCO-RR-6-D03N-SFW	SA	541080		W	X			
ISCO-RR-6-T04N-SFW	SA	541081		W	X	X[3]		
ISCO-RR-6-D04N-SFW	SA	541082		W	X			

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to the limitations on the laboratory software, the field IS were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

[3]Additional volume submitted for matrix QC

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the laboratory case narrative are summarized in the appropriate sections in the table to follow.

The case narrative listing of the samples reported in the package had one error. Sample ISCO-RR-6-D04N-SFW was listed as having been used for matrix QC analyses. However, the matrix QC analyses were not conducted on this sample. No additional volume was sent for matrix QC analyses as this sample was not scheduled for extra volume collection.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The chain of custody (COC) did not list the pH classes for samples ISCO-RR-6-T/D01N-SFW, ISCO-RR-6-T/D02N-SFW, ISCO-RR-6-T/D03N-SFW, and ISCO-RR-6-T/D04N-SFW. These samples were analyzed without any dilution.
Holding Times	No	The prescribed analytical holding time of 48 hours for nitrate as N, nitrite as N, orthophosphate, and BOD_5 was not met for three samples. The time exceedances were less than two times the holding time, thereby resulting in the qualification of these results as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken nine days after sampling and seven days beyond log-in. The pH for all samples was measured approximately five and a half hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD ISCO-RR-6-T01N-SFWMS ISCO-RR-6-D02N-SFWMS ISCO-RR-6-T04N-SFWMS • PDS ISCO-RR-6-T01N-SFWA ISCO-RR-6-D02N-SFWA • LD ISCO-RR-6-T01N-SFWREP ISCO-RR-6-D02N-SFWREP ISCO-RR-6-T04N-SFWREP	No	The samples listed to the left were used for matrix QC analyses as specified by the ISCO Bottle Filling Logistics tables contained in the Automated Samplers on the Red River Field Sampling Plan, with one modification. The extra W-6 bottle planned at the third sampling interval did not fill. As such the extra bottle filled at the forth sampling interval was submitted for matrix QC analyses for the inorganic parameters analyzed from the W-6 bottle rather than the W-8 bottle. The reason for this substitution is that a greater number of analyses were performed on the W-6 bottle (6 analytes) vs the W-8 bottle (1 analyte). As a result, there was not enough extra sample volume to do a laboratory duplicate analysis for TSS, but matrix QC analyses were conducted for the other six inorganic analytes. The matrix spike analysis of sample ISCO-RR-6-T04N-SFW recovered sulfate below the acceptance range of 75-125%, suggesting a potential low bias in the reporting of sulfate results in samples. The matrix spike analysis of sample ISCO-RR-6-T01N-SFW recovered arsenic, lead, and selenium below the acceptance range of 75-125%, suggesting a potential low bias in the reporting of these analytes in samples. Table 1.3 summarizes these analytes along with the associated percent recoveries and the qualification codes assigned to the parent samples. Post digestion spikes were performed on all metal analytes. The post digestion spike recoveries for those analytes that did not meet the specified

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		criterion for the initial matrix spike recoveries were reviewed. Selenium was recovered below the acceptance range in sample ISCO-RR-6-T01N-SFW, suggesting a potential low bias in the reporting of selenium. At this time, selenium in this sample was qualified as estimated (J), with a low bias, as listed in Table 1.3. The result for fluoride in sample ISCO-RR-T04N-SFW was qualified as estimated (J) on the basis of laboratory duplicate disagreement. Fluoride was measured in the original sample at 0.40 mg/L, and in the duplicate at 0.18 mg/L. As both concentrations were less than 5x the RL (0.10 mg/L), the absolute difference was compared to 1x the RL, thereby resulting in qualification. The matrix quality control results for the September 2003 surface water and Storm Event #5 sampling events will be evaluated collectively and any resultant data qualification will be summarized in the individual overall assessments for each event.
Method QC • Surrogates • Serial Dilution (A) ISCO-RR-6-T01N-SFW ISCO-RR-6-D02N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	No	The internal standard recovery of ^{89}Y was slightly above the criterion of 30-120% for the ICPMS analysis of sample ISCO-RR-6-T03N-SFW. As mentioned in the laboratory case narrative, this sample was analyzed on the trace ICP, resulting in molybdenum results comparable to those attained from the ICPMS. Consequently, the ICPMS result was reported because it was confirmed by the ICP. As a conservative measure, the molybdenum result for this sample was qualified as estimated. Two serial dilution tests were conducted on matrix spike samples ISCO-RR-T01N-SFW and ISCO-RR-6-D02N-SFW. The serial dilution results could not be used to assess potential interferences for 4 of the 24 metals analyzed by ICP since 20 analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution for both samples. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. Table 1.4 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The orthophosphate concentration of 0.49 mg/L in sample GHGC-T01N-SFW was greater than the total phosphorus concentration of 0.10 mg/L. Due to the fact that both partial and total concentrations for both samples did not exceed 5x the RL, the absolute difference between the partial and total results were compared to an evaluation criterion of ±2x RL. The orthophosphate and phosphorus results for sample GHGC-T01N-SFW were accordingly qualified as estimated (J) with an indeterminate direction of bias. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ± 13% to assess the usability of the data. All reported cation/anion balances met this criterion and consequently did not require data qualification. As noted in the laboratory case narrative, the cation/anion balance for the Storm water samples (STORM1-T01N-SFW and STORM1-DO1N-SFW) was not calculated due to the fact that a limited list of inorganic analytes were analyzed, and the calculated balance would not have been a representative assessment of the data quality. The ratios of calculated versus measured TDS for all field samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	Yes	No field QC samples were analyzed with this data package. The field QC results for the September 2003 surface water and Storm Event #5 sampling events will be evaluated collectively and any resultant data qualification will be summarized in the individual overall assessments for each event.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	The high standard of nitrate dropped on some ICALs, however all samples were within the range of the calibration curve.
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	Information regarding the mass resolution is not available due to software limitations. However, acceptable mass resolution can be inferred from the other QC sample results, which satisfied evaluation criteria.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Cond. (µmhos/cm)	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Orthophosphate (mg/L)	BOD_5 (mg/L)	pH (std. Units)
LOWREGOAT2-T01N-SFW	499 J	0.64 J	0.0050 UJ	0.017 J	1.3 UJ	7.2 J
GHGC-T01N-SFW	436 J	0.45 J	0.0050 UJ	0.49 J	1.3 UJ	7.4 J
STORM1-T01N-SFW	225 J	0.67 J	0.0050 UJ	0.022 J	1.3 UJ	8.0 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P)	--	---	32.9	---	65.4	30.7	GHGC-D01N-SFW ISCO-RR-6-D01N-SFW LOWREGOAT2-D01N-SFW STORM1-D01N-SFW	U MB-I U MB,CCB-I
Antimony (MS)	0.7	0.7	0.6	---	---	0.5	LOWREGOAT2-T01N-SFW	U CCB-I
Beryllium (P)	0.3	0.5	0.3	0.6	---	0.3	GHGC-T01N-SFW ISCO-RR-6-D01N-SFW ISCO-RR-6-T01N-SFW LOWREGOAT2-T01N-SFW STORM1-D01N-SFW	U CCB-I
Iron (P)	---	---	40.5	---	---	27.8	ISCO-RR-6-D02N-SFW ISCO-RR-6-D03N-SFW	U CCB-I
Zinc (P)	---	---	---	---	15.7	2.0	GHGC-D01N-SFW GHGC-T01N-SFW ISCO-RR-6-D01N-SFW LOWREGOAT2-D01N-SFW LOWREGOAT2-T01N-SFW STORM1-D01N-SFW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Qualification Codes
ISCO-RR-6-T01N-SFW				
Antimony	37.1	N/A	75-125%	UJ MS-L parent
Lead	64.8			J MS-L parent
Selenium	74.5	71.6		J MS, PDS-L parent
ISCO-RR-6-T04N-SFW				
Sulfate	69.5	N/A	75-125%	J MS-L parent

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification
ISCO-RR-6-T01N-SFW		
Arsenic	14.1	J DL-L parent
Cadmium	18.0	
Molybdenum	17.3	
Selenium	32.9	
ISCO-RR-6-D02N-SFW		
Selenium	17.9	UJ DL-L parent

MOLYCORP RI/FS
DATA VALIDATION REPORT
FOR THE
GSI SAMPLING EVENT
(CONDUCTED IN OCTOBER 2003)

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004

URS

URS Corporation
8181 E. Tufts Avenue
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140504

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Summary of Reanalyses 2-1

Section 3 Data Review Process 3-1

Section 4 Data Review Commentary 4-1

4.1 Data Review Narratives 4-1
4.2 General Data Quality Issues 4-1
4.2.1 Dilution Schemes/Non-Detects With Elevated RLs 4-1
4.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 4-1
4.2.3 Non-Valid Matrix Spikes 4-2
4.2.4 Laboratory Performance Review (LPR) Findings 4-2

Section 5 Collective Summary/Assessment of Matrix QC 5-1

5.1 Matrix Spike Results (Accuracy Evaluation) 5-1
5.1.1 GSI Surface Water Matrix Spike Results 5-2
5.1.2 GSI Piezometer Water Matrix Spike Results 5-3
5.1.3 GSI Sediment Matrix Spike Results 5-4
5.2 Laboratory Duplicate Results (Precision Evaluation) 5-4
5.3 Serial Dilution Results 5-6
5.3.1 GSI Surface Water Serial Dilution Results 5-7
5.3.2 GSI Piezometer Water Serial Dilution Results 5-8
5.3.3 GSI Chambers Water Serial Dilution Results 5-9
5.3.4 GSI Sediment Serial Dilution Results 5-9

Section 6 Collective Summary/Assessment of Field QC 6-1

6.1 Field Duplicate Results 6-1
6.2 Rinsate Blank Results 6-2
6.2.1 GSI Surface Water Rinsate Blank Results 6-3
6.2.2 GSI Sediment Rinsate Blank Results 6-3
6.3 Field Blank Results 6-4

Section 7 On-Site Ammonia Analyses 7-1

7.1 Method Validation 7-1
7.2 Data Validation 7-1

TABLE OF CONTENTS

Section 8 Overall Data Quality Indicator Assessment 8-1

8.1 Precision 8-1
8.2 Accuracy 8-1
8.3 Completeness 8-1
8.4 Representativeness 8-2
8.5 Comparability 8-2
8.6 Sensitivity 8-2

List of Tables

Table 1.1 List of Field Samples Submitted for Analysis
Table 5-1 Field Samples Designated for Matrix QC Analysis
Table 5-2 Inorganics Matrix Spike Results for GSI Surface Water
Table 5-3 Inorganics Matrix Spike Results for GSI Piezometer Water
Table 5-4 Inorganics Laboratory Duplicate Results
Table 5-5 Inorganic Laboratory Duplicate Exceedances
Table 5-6 ICP Serial Dilution Samples
Table 5-7 ICP Serial Dilution Results for GSI Surface Water
Table 5-8 ICP Serial Dilution Results for GSI Piezometer Water
Table 5-9 ICP Serial Dilution Results for GSI Chambers Water
Table 6-1 Summary of Field Duplicate GSI Samples Collected
Table 6-2 Summary of Field Duplicate GSI Sample Exceedances
Table 6-3 Summary of Rinsate Blank Results for GSI Surface Water
Table 6-4 Summary of Rinsate Blank Results for GSI Sediment

List of Attachments

Attachment 1.1 Data Review Summary for Data Package WAT187S
Attachment 1.2 Data Review Summary for Data Package WAT188S
Attachment 1.3 Data Review Summary for Data Package WAT189S
Attachment 1.4 Data Review Summary for Data Package WAT190S
Attachment 1.5 Data Review Summary for Data Package WAT191S
Attachment 1.6 Data Review Summary for Data Package WAT192S
Attachment 1.7 Data Review Summary for Data Package WAT193S
Attachment 1.8 Data Review Summary for Data Package WAT194S
Attachment 1.9 Data Review Summary for Data Package WAT194SA

TABLE OF CONTENTS

Attachment 1.10 Data Review Summary for Data Package WAT195
Attachment 1.11 Data Review Summary for Data Package WAT197S
Attachment 1.12 Data Review Summary for Data Package WAT198S
Attachment 1.13 Data Review Summary for Data Package WAT199S
Attachment 1.14 Data Review Summary for Data Package SOL094

This Data Validation Report (DVR) contains the results of the data validation conducted for 30 surface water samples, 60 piezometer samples, 48 chambers samples, 7 sediment samples, and associated quality control (QC) samples collected in during the Groundwater Surface Water Interaction (GSI) study as part of the Molycorp RI/FS. The following five sampling events were part of the GSI study:

- GSI Surface Water
- GSI Piezometer
- GSI Chambers
- GSI Sediment
- On-Site Ammonia analyses

The groundwater, surface water and sediment samples were sent to STL Burlington (STL-B), in Colchester, Vermont for metals and inorganic parameters analysis. In total, thirteen data packages were reported for the GSI study. The results for the GSI Surface Water event were reported in data packages WAT187 through WAT191. The results for the GSI Piezometer event were reported in data packages WAT192 through WAT195 and WAT194SA (reanalyses), the results for the GSI Chambers event were reported in data packages WAT197 through WAT199 and the results for the GSI Sediment event were reported in data package SOL094 (rinsate blank results for the GSI Sediment event were reported in WAT208).

- all GSI Surface Water samples were analyzed for total metals, dissolved metals and inorganic parameters (aqueous media);
- all GSI Piezometer samples were analyzed for dissolved metals and inorganic parameters (fluoride, sulfate, TOC only);
- all GSI Chambers samples were analyzed for dissolved metals and inorganic parameters (fluoride, sulfate and TOC only); and
- all GSI Sediment samples were analyzed for total metals and inorganic parameters (solid media) as defined in the RI/FS QAPP.

This data validation report describes the data validation process used and presents the data review results for the surface water and associated QC samples submitted to STL for chemical analysis. The field sample IDs and associated data package numbers are provided in Table 1-1.

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
GSI Surface Water: total metals, dissolved metals and inorganic parameters (aqueous media)		
WAT187	LR-1-T00N-SFW	
	LR-1-D00N-SFW	
	LR-16-T00N-SFW	
	LR-16-D00N-SFW	
	RR-15-T00N-SFW	
	RR-15-D00N-SFW	
	LR-8A-T00N-SFW	
	LR-8A-D00N-SFW	
	ZWERGLE-T00N-SFW	
	ZWERGLE-D00N-SFW	
	ZWERGLE-T00D-SFW	FD to ZWERGLE-T00N-SFW
	ZWERGLE-D00D-SFW	FD to ZWERGLE-D00N-SFW
	RR-5BB-T00N-SFW	MS, PDS, LD, SD
	RR-5BB-D00N-SFW	MS, PDS, LD, SD
	CUBE1-MID-QABLK	
WAT188	RR-5BB-T01N-SFW	
	RR-5BB-D01N-SFW	
	RR-5BB-T01D-SFW	FD to RR-5BB-T01N-SFW
	RR-5BB-D01D-SFW	FD to RR-5BB-D01N-SFW
	RR-15-T01N-SFW	MS, PDS, LD, SD
	RR-15-D01N-SFW	MS, PDS, LD, SD
	LR-1-T01N-SFW	
	LR-1-D01N-SFW	
	LR-16-T01N-SFW	
	LR-16-D01N-SFW	
	LR-8A-T01N-SFW	
	LR-8A-D01N-SFW	
	ZWERGLE-T01N-SFW	
	ZWERGLE-D01N-SFW	
WAT189	LR-16-T02N-SFW	SD
	LR-16-D02N-SFW	
	LR-8A-T02N-SFW	
	LR-8A-D02N-SFW	
	RR-5BB-T02N-SFW	
	RR-5BB-D02N-SFW	
	ZWERGLE-T02N-SFW	
	ZWERGLE-D02N-SFW	
	LR-1-T02N-SFW	
	LR-1-D02N-SFW	
	RR-15-T02N-SFW	
	RR-15-D02N-SFW	

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
WAT190	LR-1-T03N-SFW	SD
	LR-1-D03N-SFW	
	RR-15-T03N-SFW	
	RR-15-D03N-SFW	
	ZWERGLE-T03N-SFW	
	ZWERGLE-D03N-SFW	
	RR-5BB-T03N-SFW	
	RR-5BB-D03N-SFW	
	LR-16-T03N-SFW	
	LR-16-D03N-SFW	
	LR-8A-T03N-SFW	
	LR-8A-D03N-SFW	
WAT191	ZWERGLE-T04N-SFW	
	ZWERGLE-D04N-SFW	SD
	RR-5BB-T04N-SFW	
	RR-5BB-D04N-SFW	
	RR-15-T04N-SFW	
	RR-15-D04N-SFW	
	LR-1-T04N-SFW	
	LR-1-D04N-SFW	
	LR-8A-T04N-SFW	
	LR-8A-D04N-SFW	
	LR-16-T04N-SFW	
	LR-16-D04N-SFW	
GSI Piezometer: dissolved metals and inorganic parameters (fluoride, sulfate, and TOC only)		
WAT192	ZWERGLE-T00N-PS	
	ZWERGLE-D00N-PS	
	ZWERGLE-T00N-PD	
	ZWERGLE-D00N-PD	
	RR-5BB-T00N-PS	
	RR-5BB-D00N-PS	
	RR-5BB-T00N-PD	
	RR-5BB-D00N-PD	
	RR-15-T00N-PS	
	RR-15-D00N-PS	
	RR-15-T00N-PD	MS
	RR-15-D00N-PD	MS, PDS, SD
	LR-1-T00N-PS	MS
	LR-1-D00N-PS	MS, PDS, SD
	LR-1-T00N-PD	LD
	LR-1-D00N-PD	LD
	LR-8A-T00N-PS	
	LR-8A-D00N-PS	
	LR-8A-T00N-PD	
	LR-8A-D00N-PD	
	LR-16-T00N-PS	

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
	LR-16-D00N-PS	
	LR-16-T00N-PD	
	LR-16-D00N-PD	
	ZWERGLE-T01N-PS	
	ZWERGLE-D01N-PS	
	ZWERGLE-T01N-PD	
	ZWERGLE-D01N-PD	
	RR-5BB-T01N-PS	
	RR-5BB-D01N-PS	
	RR-5BB-T01N-PD	
	RR-5BB-D01N-PD	
	RR-15-T01N-PS	
	RR-15-D01N-PS	
	RR-15-T01N-PD	
	RR-15-D01N-PD	
	LR-1-T01N-PS	LD
	LR-1-D01N-PS	LD
	LR-1-T01N-PD	
	LR-1-D01N-PD	
WAT193	LR-8A-T01N-PS	
	LR-8A-D01N-PS	
	LR-8A-T01N-PD	
	LR-8A-D01N-PD	
	LR-8A-T01D-PS	FD to LR-8A-T01N-PS
	LR-8A-D01D-PS	FD to LR-8A-D01N-PS
	LR-16-T01N-PS	
	LR-16-D01N-PS	
	LR-16-T01N-PD	
	LR-16-D01N-PD	
	ZWERGLE-T02N-PS	
	ZWERGLE-D02N-PS	
	ZWERGLE-T02N-PD	
	ZWERGLE-D02N-PD	
	RR-5BB-T02N-PS	MS
	RR-5BB-D02N-PS	MS, PDS, SD
	RR-5BB-T02N-PD	LD
	RR-5BB-D02N-PD	LD
	RR-15-T02N-PS	
	RR-15-D02N-PS	
	RR-15-T02N-PD	
	RR-15-D02N-PD	
	RR-15-T02D-PS	FD to RR-15-T02N-PS
	RR-15-D02D-PS	FD to RR-15-D02N-PS
	ZWERGLE-T03N-PS	
	ZWERGLE-D03N-PS	
	ZWERGLE-T03N-PD	MS
	ZWERGLE-D03N-PD	MS, PDS, SD

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
	RR-5BB-T03N-PS	LD
	RR-5BB-D03N-PS	LD
	RR-5BB-T03N-PD	
	RR-5BB-D03N-PD	
	RR-15-T03N-PS	
	RR-15-D03N-PS	
	RR-15-T03N-PD	
	RR-15-D03N-PD	
	RR-15-T03D-PD	FD to RR-15-T03N-PD
	RR-15-D03D-PD	FD to RR-15-D03N-PD
	LR-1-T02N-PS	
	LR-1-D02N-PS	
WAT194	LR-1-T02N-PD1	
	LR-1-D02N-PD	
	LR-8A-T02N-PS1	
	LR-8A-D02N-PS	
	LR-8A-T02N-PD	
	LR-8A-D02N-PD	
	LR-16-T02N-PS	
	LR-16-D02N-PS	
	LR-16-T02N-PD	
	LR-16-D02N-PD	
	LR-1-T03N-PS	
	LR-1-D03N-PS	
	LR-1-T03N-PD	
	LR-1-D03N-PD	
	LR-8A-T03N-PS1	
	LR-8A-D03N-PS	
	LR-8A-T03N-PD	
	LR-8A-D03N-PD	
	LR-16-T03N-PS	MS, LD
	LR-16-D03N-PS2	MS,PDS,SD
	LR-16-T03N-PD	LD
	LR-16-D03N-PD	LD
	ZWERGLE-T04N-PS1	
	ZWERGLE-D04N-PS	
	ZWERGLE-T04N-PD1	
	ZWERGLE-D04N-PD	
	RR-5BB-T04N-PS	
	RR-5BB-D04N-PS	
	RR-5BB-T04N-PD	
	RR-5BB-D04N-PD	
	RR-15-T04N-PS	
	RR-15-D04N-PS	
	RR-15-T04N-PD	
	RR-15-D04N-PD	
	LR-16-T04D-PD	FD to LR-16-T04N-PD
	LR-16-D04D-PD	FD to LR-16-D04N-PD

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
WAT195	LR-1-T04N-PS	
	LR-1-D04N-PS	
	LR-1-T04N-PD	
	LR-1-D04N-PD	
	LR-8A-T04N-PS	
	LR-8A-D04N-PS	
	LR-8A-T04N-PD	MS
	LR-8A-D04N-PD	MS,PDS,SD
	LR-16-T04N-PS	LD
	LR-16-D04N-PS	LD
	LR-16-T04N-PD	
	LR-16-D04N-PD	
	LR-1-T04D-PS	FD to LR-1-T04N-PS
	LR-1-D04D-PS	FD to LR-1-D04N-PS
	LR-1-T04D-PD	FD to LR-1-T04N-PD
	LR-1-D04D-PD	FD to LR-1-D04N-PD
GSI Chambers: dissolved metals and inorganic parameters (fluoride, sulfate, TOC)		
WAT197	ZWERGLE-T01N-ASC	
	ZWERGLE-D01N-ASC	SD
	ZWERGLE-T01N-WCC	
	ZWERGLE-D01N-WCC	
	RR-5BB-T01N-ASC	
	RR-5BB-D01N-ASC	
	RR-5BB-T01N-WCC	
	RR-5BB-D01N-WCC	
	RR-15-T01N-ASC	
	RR-15-D01N-ASC	
	RR-15-T01N-WCC	
	RR-15-D01N-WCC	
	LR-1-T01N-ASC	
	LR-1-D01N-ASC	
	LR-1-T01N-WCC	
	LR-1-D01N-WCC	
	LR-8A-T01N-ASC	
	LR-8A-D01N-ASC	
	LR-8A-T01N-WCC	
	LR-8A-D01N-WCC	
	LR-16-T01N-ASC	
	LR-16-D01N-ASC	
	LR-16-T01N-WCC	
	LR-16-D01N-WCC	
	ZWERGLE-T02N-ASC	
	ZWERGLE-D02N-ASC	
	ZWERGLE-T02N-WCC	
	ZWERGLE-D02N-WCC	
	LR-1-T02N-ASC	

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
	LR-1-D02N-ASC	
	LR-1-T02N-WCC	
	LR-1-D02N-WCC	
	RR-5BB-T02N-ASC	
	RR-5BB-D02N-ASC	
	RR-5BB-T02N-WCC	
	RR-5BB-D02N-WCC	
	LR-8A-T02N-ASC	
	LR-8A-D02N-ASC	
	LR-8A-T02N-WCC	
	LR-8A-D02N-WCC	
WAT198	RR-15-T02N-ASC	
	RR-15-D02N-ASC	
	RR-15-T02N-WCC	
	RR-15-D02N-WCC	SD
	LR-16-T02N-ASC	
	LR-16-D02N-ASC	
	LR-16-T02N-WCC	
	LR-16-D02N-WCC	
	ZWERGLE-T03N-ASC	
	ZWERGLE-D03N-ASC	
	ZWERGLE-T03N-WCC	
	ZWERGLE-D03N-WCC	
	RR-5BB-T03N-ASC	
	RR-5BB-D03N-ASC	
	RR-5BB-T03N-WCC	
	RR-5BB-D03N-WCC	
	RR-15-T03N-ASC	
	RR-15-D03N-ASC	
	RR-15-T03N-WCC	
	RR-15-D03N-WCC	
	LR-1-T03N-ASC	
	LR-1-D03N-ASC	
	LR-1-T03N-WCC	
	LR-1-D03N-WCC	
	LR-8A-T03N-ASC	
	LR-8A-D03N-ASC	
	LR-8A-T03N-WCC	
	LR-8A-D03N-WCC	
	LR-16-T03N-ASC	
	LR-16-D03N-ASC	
	LR-16-T03N-WCC	
	LR-16-D03N-WCC	

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
WAT199	ZWERGLE-T04N-ASC	
	ZWERGLE-D04N-ASC	SD
	ZWERGLE-T04N-WCC	
	ZWERGLE-D04N-WCC	
	RR-5BB-T04N-ASC	
	RR-5BB-D04N-ASC	
	RR-5BB-T04N-WCC	
	RR-5BB-D04N-WCC	
	RR-15-T04N-ASC	
	RR-15-D04N-ASC	
	RR-15-T04N-WCC	
	RR-15-D04N-WCC	
	LR-1-T04N-ASC	
	LR-1-D04N-ASC	
	LR-1-T04N-WCC	
	LR-1-D04N-WCC	
	LR-8A-T04N-ASC	
	LR-8A-D04N-ASC	
	LR-8A-T04N-WCC	
	LR-8A-D04N-WCC	
	LR-16-T04N-ASC	
	LR-16-D04N-ASC	
	LR-16-T04N-WCC	
	LR-16-D04N-WCC	
GSI Sediment: dissolved metals and inorganic parameters (solid media)		
SOL094	ZWERGLE-T04N-SED	
	RR-5BB-T04N-SED	MS,PDS,LD,SD
	RR-15-T04N-SED	
	RR-15-T04D-SED	FD to RR-15-T04N-SED
	LR-1-T04N-SED	
	LR-8A-T04N-SED	
	LR-16-T04N-SED	
	CONTROL-T04N-SED	

FD = Field Duplicate MS = Matrix Spike
SD = Serial Dilution PDS = Post-Digestion Spike LD = Laboratory Duplicate
[1] Results for sulfate were reanalyzed and reported in data package WAT194A.
[2] Results for dissolved metals were reanalyzed and reported in data package WAT194A.

One piezometer sample reported in WAT194, LR-16-D03N-PS, displayed numerous dissolved metals results inconsistently elevated when compared to the same location (LR-16) on previous days. At the client's request, STL-B investigated the appearance of the sample submitted for the sample collected at location LR-16 on Day 3 of the study. The sample provided for the dissolved metals analysis was turbid and contained solids that collected on the bottom of the container, whereas the container provided for the fluoride and sulfate analysis was clear and had a pH< 2 rather than the native pH of the composite sample, which would be expected to be around 6.6. As such, it was apparent that the labels for these containers were accidentally reversed. While the sulfate and fluoride results were not affected, the original dissolved metals analysis reported in WAT194S was conducted on the bottle containing the unfiltered sample and the results are likely biased high due to the solids present in the sample. The laboratory performed an analysis of metals on the filtered sample and the results are presented in package WAT194SA. Based on the review of this package, the dissolved metals results for sample LR-16-D03N-PS reported in this package were selected for reporting and the original dissolved metals results reported in WAT194S were rejected.

Sulfate reanalyses for WAT194S were performed on samples LR-1-T02N-PD, LR-8A-T02N-PS, LR-8A-T03N-PS, ZWERGLE-T04N-PS, ZWERGLE-T04N-PD and RR-5BB-T04N-PS, which initially exhibited extremely elevated results. It is suspected that the initial sulfate results were accidentally conducted on a sample aliquot from the sulfuric preserved bottles. The sulfate reanalyses performed for sulfate replace the original results supplied in WAT194S. In all cases, the results for the original and reanalyses have been annotated to indicate which results were selected for reporting.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate or spike duplicate analysis, post-digestion spike recoveries, ICP serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, rinsate blanks, field blanks, and trip blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1 and is as follows: if no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used; if no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used; if no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

Section 4.0 includes the data review narratives for each of the data packages. In all cases of professional judgment exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative.

The site-specific matrix spike (MS) results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the

matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 5.0 provides the collective assessment of the matrix QC results (MS/MSD results, laboratory duplicate results, and serial dilution results) and associated sample qualification. Section 6.0 presents the collective summary of the field QC results (field and rinsate blanks and field duplicate results) and associated sample qualification. Section 7.0 presents discussion of the on-site ammonia analyses. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 8.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

4.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for the data packages included in this event. In order to attain the frequency requirements for laboratory performance reviews, three data package (WAT192S, WAT1887S, and SOL094) were evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 3.0. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

4.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identify whether any findings globally affect all relevant samples analyzed for the GSI study. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

4.2.1 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

During the project, the need to analyze all surface water samples without dilution, regardless of pH, was identified. As such, surface water samples were generally analyzed without dilution, unless dilution was necessary based on analyte concentrations present in the sample. Similarly, the piezometer and chamber water samples were analyzed at the lowest dilutions possible.

4.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly

variable pH range of the water samples and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

4.2.3 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked analytes. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

4.2.4 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in section 3.0. STL data package WAT187, WAT192 and SOL094 were used to evaluate laboratory performance criteria. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated for all packages for this event included:

- Continuing Calibration Verification (CCV) results;
- Initial Calibration Verification (ICV) results; and
- Laboratory Control Sample (LCS) recovery results.

The site-specific matrix spike (MS) results, laboratory duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analysis, LD analyses, and the serial dilution results for the samples collected during the sampling event.

The Table 5-1 illustrates the site-samples that were used to prepare matrix spike samples. As two matrix spikes were prepared and analyzed for metals, dissolved metals and inorganic parameters for 30 GSI surface water field sample sites (excluding field duplicate samples), six matrix spikes were prepared and analyzed for dissolved metals and inorganic parameters for 60 GSI piezometer field sample sites (excluding field duplicate samples) and one matrix spike was prepared and analyzed for metals and inorganic parameters for 7 GSI sediment field sample sites (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied. Matrix spike analyses were not possible for the GSI Chambers Water sampling event due to the limited sampling volume available at each site. The GSI surface waters collected were considered to be a comparable matrix to the GSI chambers water. Therefore, any overall qualification based on matrix spikes found in GSI surface water samples was applied to the GSI chambers water samples.

Table 5-1
Field Samples Designated for Matrix QC Analysis

GSI Event	Sample ID	Matrix	Data Package	Analyses
GSI SFW	RR-5BB-T00N-SFW	Surface Water	WAT187	Metals and Inorganic Parameters
	RR-5BB-D00N-SFW	Surface Water	WAT187	Dissolved Metals
	RR-15-T01N-SFW	Surface Water	WAT188	Metals and Inorganic Parameters
	RR-15-D01N-SFW	Surface Water	WAT188	Dissolved Metals
GSI Piezometer	RR-15-T00N-PD	Groundwater	WAT192	Inorganic Parameters
	RR-15-D00N-PD	Groundwater	WAT192	Dissolved Metals
	LR-1-T00N-PS	Groundwater	WAT192	Inorganic Parameters
	LR-1-D00N-PS	Groundwater	WAT192	Dissolved Metals
	RR-5BB-T02N-PS	Groundwater	WAT193	Inorganic Parameters
	RR-5BB-D02N-PS	Groundwater	WAT193	Dissolved Metals
	ZWERGLE-T03N-PD	Groundwater	WAT193	Inorganic Parameters
	ZWERGLE-D03N-PD	Groundwater	WAT193	Dissolved Metals
	LR-16-T03N-PS	Groundwater	WAT194	Inorganic Parameters
	LR-16-D03N-PS	Groundwater	WAT194	Dissolved Metals
	LR-8A-T04N-PD	Groundwater	WAT195	Inorganic Parameters
	LR-8A-D04N-PD	Groundwater	WAT195	Dissolved Metals
GSI Sediment	RR-5BB-T04N-SED	Sediment	SOL094	Metals and Inorganic Parameters

5.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

A number of spike recoveries were outside of the QC acceptance limits of 75%-125%. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the magnitude of outages, and the number of valid spike recoveries relative to the size of the sample set.

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the MS exceedances were caused by the sample matrix, a bias in the analytical system, or a combination of both. Recoveries for nearly all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

5.1.1 GSI Surface Water Matrix Spike Results

Table 5-2 summarizes the GSI surface water results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Table 5-2
Inorganics Matrix Spike Results for GSI Surface Water

Analyte	Total				Dissolved				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Aluminum	2	0	0	97.3	2	0	0	107.5	None
Antimony	2	0	0	96.8	2	0	0	100.0	None
Arsenic	2	0	0	91.6	2	0	0	93.8	None
Barium	2	0	0	97.8	2	0	0	104.4	None
Beryllium	2	0	0	102.0	2	0	0	108.6	None
Boron	2	0	0	99.5	2	0	0	105.5	None
Cadmium	2	0	0	93.9	2	0	0	94.7	None
Chromium	2	0	0	100.2	2	0	0	107.1	None
Cobalt	2	0	0	97.9	2	0	0	104.5	None
Copper	2	0	0	96.8	2	0	0	98.0	None
Iron	2	0	0	102.3	2	0	0	112.0	None
Lead	2	0	0	101.1	2	0	0	103.3	None
Manganese	2	0	0	96.7	2	0	0	105.3	None
Nickel	2	0	0	98.2	2	0	0	100.8	None
Mercury	2	0	0	110.5	2	0	0	105.5	None
Selenium	2	0	0	85.4	2	0	0	87.3	None
Molybdenum	2	0	0	99.2	2	0	0	103.9	None
Silver	2	0	0	101.1	2	0	0	103.8	None
Thallium	2	0	0	101.7	2	0	0	104.1	None
Vanadium	2	0	0	100.4	2	0	0	102.7	None
Zinc	2	0	0	97.7	2	0	0	105.6	None
Cyanide	2	0	0	98.1	NA	NA	NA	NA	None
Chloride	2	0	0	111.0	NA	NA	NA	NA	None
Nitrate	2	0	0	112.3	NA	NA	NA	NA	None
Total Alkalinity	2	0	0	107.6	NA	NA	NA	NA	None
Fluoride	2	0	0	104.7	NA	NA	NA	NA	None
Ammonia	2	0	0	76.8	NA	NA	NA	NA	None
TKN	2	0	0	100.0	NA	NA	NA	NA	None
Nitrite	2	0	0	111.9	NA	NA	NA	NA	None
Orthophosphorous	2	0	0	100.0	NA	NA	NA	NA	None
Phosphorous	2	0	0	104.3	NA	NA	NA	NA	None

Table 5-2
Inorganics Matrix Spike Results for GSI Surface Water

Analyte	Total				Dissolved				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Sulfate	2	1	0	80.7	NA	NA	NA	NA	U MS-L for parent sample only (RR-15-T01N-SFW).
BOD	2	0	0	100.8	NA	NA	NA	NA	None
COD	2	0	0	97.9	NA	NA	NA	NA	None
TOC	2	0	0	102	NA	NA	NA	NA	None

All surface water sample matrix spike recoveries except for one were within limits. For sulfate, qualification was limited to only the parent sample because the average matrix spike percent recovery was within QC acceptance limits.

5.1.2 GSI Piezometer Water Matrix Spike Results

The table below summarizes the GSI piezometer water results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Table 5-3
Inorganics Matrix Spike Results for GSI Piezometer Water

Analyte	Total				Dissolved				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Aluminum	NA	NA	NA	NA	5	0	0	103.2	None
Antimony	NA	NA	NA	NA	6	1	0	91.5	J MS-L for parent sample only (LR-16-D03N-PS).
Arsenic	NA	NA	NA	NA	6	0	0	96.2	None
Barium	NA	NA	NA	NA	6	0	0	101.8	None
Beryllium	NA	NA	NA	NA	6	0	0	105.2	None
Boron	NA	NA	NA	NA	6	0	0	101.7	None
Cadmium	NA	NA	NA	NA	6	0	0	95.6	None
Chromium	NA	NA	NA	NA	6	0	0	104.6	None
Cobalt	NA	NA	NA	NA	6	0	0	103.1	None
Copper	NA	NA	NA	NA	6	0	0	102.0	None
Iron	NA	NA	NA	NA	5	0	0	107.8	None
Lead	NA	NA	NA	NA	6	0	0	107.7	None
Manganese	NA	NA	NA	NA	6	0	0	103.1	None
Nickel	NA	NA	NA	NA	6	0	0	101.4	None
Selenium	NA	NA	NA	NA	6	1	0	84.6	J MS-L for parent sample only (LR-16-D03N-PS).
Molybdenum	NA	NA	NA	NA	6	1	0	98.0	No qualification because recovery of 74.6 rounds to 75%.

Table 5-3
Inorganics Matrix Spike Results for GSI Piezometer Water

Analyte	Total				Dissolved				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Silver	NA	NA	NA	NA	6	0	1	104.9	No qualification because recovery of 125.1 rounds to 125%.
Thallium	NA	NA	NA	NA	6	0	0	104.3	None
Vanadium	NA	NA	NA	NA	6	0	0	99.5	None
Zinc	NA	NA	NA	NA	6	0	0	102.3	None
Fluoride	6	0	0	99.8	NA	NA	NA	NA	None
Sulfate	6	3	0	77.7	NA	NA	NA	NA	J MS-L for all results.
TOC	6	0	1	106	NA	NA	NA	NA	J MS-H for parent sample only (LR-8A-T04N-PD).

Qualification limited to parent sample only for TOC. For sulfate, although the average percent recovery was within QC acceptance limits, matrix spike qualification was applied to all samples because 3 of 6 (50%) results were outside QC acceptance limits and indicating an overall trend of low matrix spike recoveries.

5.1.3 GSI Sediment Matrix Spike Results

For GSI sediment data, one sample was used for matrix spike analysis. Therefore, analyte concentrations qualified as estimated based on matrix spike recoveries were limited to the parent sample only since it would not be appropriate to assess whether or not a systematic problem exists on limited information. All matrix spike recoveries were within QC acceptable limits, except antimony and selenium, which yielded recoveries of 34.1% and 44.4%, respectively.

5.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Table 5-4 illustrates the site-samples that were used to prepare laboratory duplicate samples. As two laboratory duplicates were prepared and analyzed for metals, dissolved metals and inorganic parameters for 30 GSI surface water field sample sites (excluding field duplicate samples), six laboratory duplicates were prepared and analyzed for dissolved metals and inorganic parameters for 60 GSI piezometer field sample sites (excluding field duplicate samples) and one laboratory duplicate was prepared and analyzed for metals and inorganic parameters for 7 GSI sediment field sample sites (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied. Laboratory duplicate analyses were not possible for the GSI Chambers Water sampling event due to the limited sampling volume available at each site. The GSI surface waters collected were considered to be a comparable to the GSI chambers water. Therefore, any overall qualification based on laboratory duplicate analysis found in GSI surface water samples were applied to the GSI chambers water samples.

Table 5-4
Inorganics Laboratory Duplicate Results

GSI Event	Sample ID	Matrix	Data Package	Analyses
GSI SFW	RR-5BB-T00N-SFW	Surface Water	WAT187	Metals and Inorganic Parameters
	RR-5BB-D00N-SFW	Surface Water	WAT187	Dissolved Metals
	RR-15-T01N-SFW	Surface Water	WAT188	Metals and Inorganic Parameters
	RR-15-D01N-SFW	Surface Water	WAT188	Dissolved Metals
GSI Piezometer	LR-1-T00N-PD	Groundwater	WAT192	Inorganic Parameters
	LR-1-D00N-PD	Groundwater	WAT192	Dissolved Metals
	LR-1-T01N-PS	Groundwater	WAT192	Inorganic Parameters
	LR-1-D01N-PS	Groundwater	WAT192	Dissolved Metals
	RR-5BB-T02N-PD	Groundwater	WAT193	Inorganic Parameters
	RR-5BB-D02N-PD	Groundwater	WAT193	Dissolved Metals
	RR-5BB-T03N-PS	Groundwater	WAT193	Inorganic Parameters
	RR-5BB-D03N-PS	Groundwater	WAT193	Dissolved Metals
	LR-16-T03N-PS	Groundwater	WAT194	Inorganic Parameters except fluoride
	LR-16-D03N-PS	Groundwater	WAT194	Dissolved Metals
	LR-16-T03N-PD	Groundwater	WAT194	Inorganic Parameters, fluoride only
	LR-16-D03N-PD	Groundwater	WAT194	Dissolved Metals
	LR-16-T04N-PS	Groundwater	WAT195	Inorganic Parameters
	LR-16-D04N-PS	Groundwater	WAT195	Dissolved Metals
GSI Sediment	RR-5BB-T04N-SED	Sediment	SOL094	Metals and Inorganic Parameters

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The relative percent differences (RPD) criterion ≤20% (≤35% for sediments) was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL (less than two times the greater RL for sediment). For metals data, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL, which was considered to be too low to be used as the baseline for these concentration dependent evaluations.

The RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within the QAPP acceptance limits for all laboratory duplicate analyses, with two exceptions. The exceptions and the resultant data qualifiers are summarized in the Table 5-5 below.

Table 5-5
Inorganic Laboratory Duplicate Exceedances

GSI Event	Analyte	Sample ID	Criterion	Criterion Exceedance	Action
GSI Piezometer	Lead	LR-16-D03N-PD	$\lvert Diff \rvert$<CRDL	1.6xCRDL	J D-I for parent sample only.
GSI Sediment	Manganese	RR-5BB-T04N-SED	RPD<35%	50.3%	J D-I for parent sample only.

For the GSI Piezometer matrix, qualification was limited to parent sample because only one-sixth of the valid laboratory duplicate recoveries for a given analyte were outside of the QC acceptance limits and the individual exceedance was relatively low. For the GSI Sediment matrix, qualification was limited to the parent sample because only one laboratory duplicate was performed (sample size too small to tell whether or not a systematic problem exists).

5.3 SERIAL DILUTION RESULTS

Serial dilution tests involve the analysis of a sample and a five-fold dilution of the same sample. When analyte concentrations are sufficiently high (i.e., greater that 50x the instrument detection limit [IDL]), the original result and diluted sample result are expected to be fairly comparable. If the results are not comparable, it is generally assumed that there are matrix interferences that are resulting in the suppression or elevation of the signal for one or more analytes.

The original and diluted sample results are compared by a percent difference (%D). When %Ds ≤10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate that the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result. As illustrated by the Table 5-6 below, serial dilution tests were conduced on seven surface water samples representing the GSI Surface Water matrix, six groundwater samples representing the GSI Piezometer matrix, three surface water samples representing the GSI Chambers matrix and one sediment sample representing the GSI Sediment matrix.

Table 5-6
ICP Serial Dilution Samples

GSI Event	Sample ID	Matrix	Data Package	Analyses
GSI SFW	RR-5BB-T00N-SFW	Surface Water	WAT187	Metals
	RR-5BB-D00N-SFW	Surface Water	WAT187	Dissolved Metals
	RR-15-T01N-SFW	Surface Water	WAT188	Metals
	RR-15-D01N-SFW	Surface Water	WAT188	Dissolved Metals
	LR-16-T02N-SFW	Surface Water	WAT189	Metals
	LR-1-T03N-SFW	Surface Water	WAT190	Metals
	ZWERGLE-D04N-SFW	Surface Water	WAT191	Dissolved Metals
GSI Piezometer	RR-15-D00N-PD	Groundwater	WAT192	Dissolved Metals
	LR-1-D00N-PS	Groundwater	WAT192	Dissolved Metals
	RR-5BB-D02N-PS	Groundwater	WAT193	Dissolved Metals
	ZWERGLE-D03N-PD	Groundwater	WAT193	Dissolved Metals
	LR-16-D03N-PS	Groundwater	WAT194	Dissolved Metals
	LR-8A-D04N-PD	Groundwater	WAT195	Dissolved Metals
GSI Chambers	ZWERGLE-D01N-ASC	Surface Water	WAT197	Dissolved Metals
	RR-15-D02N-WCC	Surface Water	WAT198	Dissolved Metals
	ZWERGLE-D04N-ASC	Surface Water	WAT199	Dissolved Metals
GSI Sediment	RR-5BB-T04N-SED	Sediment	SOL094	Metals

A number of %Ds between the original sample results and the result obtained from a sample diluted 1:5 were >10%. In general, qualification was generally limited to the parent samples if less than a quarter of the valid serial dilution results for a given metal were outside of the acceptance range. Conversely, qualification was generally considered necessary if more than a quarter of the results for a metal were outside the acceptance range. However, factors such as the number of valid measurements relative to the size of the sample set and the magnitude of outages were also taken into consideration.

5.3.1 GSI Surface Water Serial Dilution Results

Table 5-7 summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued for all GSI Surface Water results.

Table 5-7
ICP Serial Dilution Results for GSI Surface Water

Analyte	Total Metals					Dissolved Metals					Action
	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		
				Low	High				Low	High	
Aluminum	2	0	5.8	0	0	2	0	3.4	0	0	None
Antimony	2	0	1.3	0	0	2	0	3.3	0	0	None
Arsenic	2	0	7.4	0	0	2	0	6.4	0	0	None
Barium	2	0	3.4	0	0	2	0	0.1	0	0	None
Beryllium	2	0	3.6	0	0	2	0	1.1	0	0	None
Boron	2	0	5.7	0	0	2	0	2.3	0	0	None
Cadmium	2	0	6.3	0	0	2	0	8.5	0	0	None
Calcium	5	0	3.1	0	0	2	0	0.6	0	0	None
Chromium	2	0	3.8	0	0	2	0	0.8	0	0	None
Cobalt	2	0	3.9	0	0	2	0	0.3	0	0	None
Copper	2	0	1.3	0	0	2	0	2.3	0	0	None
Iron	2	0	5.8	0	0	2	0	2.4	0	0	None
Lead	2	0	0.5	0	0	2	0	2.6	0	0	None
Magnesium	0					0					None
Manganese	4	0	3.0	0	0	2	0	0.5	0	0	None
Nickel	2	0	2.6	0	0	2	0	4.4	0	0	None
Selenium	2	1	11.4	1	0	2	2	13.0	2	0	J/UJ DL-L for all samples
Molybdenum	3	0	3.2	0	0	2	0	3.1	0	0	None
Silver	2	0	2.5	0	0	2	0	3.4	0	0	None
Potassium	0					0					None
Thallium	2	0	1.6	0	0	2	0	2.3	0	0	None
Vanadium	2	0	1.0	0	0	2	0	2.6	0	0	None
Sodium	0					0					None
Zinc	2	0	5.2	0	0	2	0	1.5	0	0	None

Selenium exhibited 3 of 4 valid serial dilution results, as well as average differences, outside QC acceptance limits. Qualification was applied to all GSI Surface Water selenium results.

5.3.2 GSI Piezometer Water Serial Dilution Results

The table below summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued for all GSI Piezometer Water results.

Table 5-8
ICP Serial Dilution Results for GSI Piezometer Water

Analyte	Dissolved Metals					Action
	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		
				Low	High	
Aluminum	5	1	4.0	0	1	UJ DL-H for parent sample only (LR-1-D00N-PS).
Antimony	5	0	4.4	0	0	None
Arsenic	5	3	9.2	3	0	J/UJ DL-L for all samples.
Barium	5	0	3.3	0	0	None
Beryllium	5	0	3.6	0	0	None
Boron	5	1	5.9	1	0	J DL-L for parent sample only (LR-8A-D04N-PD).
Cadmium	5	2	10.0	2	0	J/UJ DL-L for all samples.
Calcium	6	0	4.0	0	0	None
Chromium	5	0	3.2	0	0	None
Cobalt	5	0	3.8	0	0	None
Copper	5	0	5.6	0	0	None
Iron	5	1	4.3	1	0	UJ DL-L for parent sample only (LR-8A-D04N-PD).
Lead	5	0	1.4	0	0	None
Magnesium	2	0	3.7	0	0	None
Manganese	5	0	3.6	0	0	None
Nickel	5	0	3.7	0	0	None
Selenium	5	3	10.9	3	0	J/UJ DL-L for all samples.
Molybdenum	6	1	8.2	1	0	UJ DL-L for parent sample only (RR-5BB-D02N-PS).
Silver	5	0	3.6	0	0	None
Potassium	0					None
Thallium	5	0	1.8	0	0	None
Vanadium	6	1	3.1	1	0	J DL-L for parent sample only (LR-16-D03N-PS).
Sodium	3	0	3.0	0	0	None
Zinc	5	0	5.6	0	0	None

Aluminum, boron, iron, molybdenum and vanadium exhibited less than a quarter valid serial dilution results, as well as average differences, outside QC acceptance limits. Therefore, qualification was limited to the parent samples only. Arsenic, cadmium, and selenium exhibited greater than a quarter valid serial dilution results, as well as average differences, outside QC acceptance limits. Qualification was applied to all GSI Piezometer arsenic, cadmium, and selenium results.

5.3.3 GSI Chambers Water Serial Dilution Results

Table 5-9 summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued for all GSI Chambers Water results.

Table 5-9
ICP Serial Dilution Results for GSI Chambers Water

Analyte	Dissolved Metals					Action
	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		
				Low	High	
Aluminum	0					None
Antimony	0					None
Arsenic	0					None
Barium	0					None
Beryllium	0					None
Boron	0					None
Cadmium	0					None
Calcium	3	0	4.5	0	0	None
Chromium	0					None
Cobalt	0					None
Copper	0					None
Iron	0					None
Lead	0					None
Magnesium	0					None
Manganese	1	0	7.9	0	0	None
Nickel	0					None
Selenium	0					None
Molybdenum	0					None
Silver	0					None
Potassium	0					None
Thallium	0					None
Vanadium	0					None
Sodium	0					None
Zinc	0					None

All applicable valid serial dilution results, as well as average differences, were within QC acceptance limits. No GSI Chambers water metal analyses were qualified based on serial dilution.

5.3.4 GSI Sediment Serial Dilution Results

For GSI sediment data, a serial dilution analysis was performed on one sample. All serial dilution analyses were within QC acceptable limits, therefore, no qualification was performed.

The site-specific blanks (field and rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. Field duplicate agreement was assessed to determine the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. The following sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

Table 6-1 presents the field duplicates collected for this event. As two field duplicates were prepared and analyzed for metals, dissolved metals and inorganic parameters for 30 GSI surface water field sample sites (excluding field duplicate samples), six field duplicates were prepared and analyzed for dissolved metals and inorganic parameters for 60 GSI piezometer field sample sites (excluding field duplicate samples) and one field duplicate was prepared and analyzed for metals and inorganic parameters for 7 GSI sediment field sample sites (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied. Field duplicate analyses were not possible for the GSI Chambers Water sampling event due to the limited sampling volume available at each site. The GSI surface waters collected were considered to be a comparable matrix to the GSI chambers water. Therefore, any overall qualification based on field duplicates found in GSI surface water samples was applied to the GSI chambers water samples.

Table 6-1
Summary of Field Duplicate GSI Samples Collected

GSI Event	Sample ID	Matrix	Data Package	Analyses
GSI SFW	ZWERGLE-T00D-SFW	Surface Water	WAT187	Metals and Inorganic Parameters
	ZWERGLE-D00D-SFW	Surface Water	WAT187	Dissolved Metals
	RR-5BB-T01D-SFW	Surface Water	WAT188	Metals and Inorganic Parameters
	RR-5BB-D01D-SFW	Surface Water	WAT188	Dissolved Metals
GSI Piezometer	LR-8A-T01D-PS	Groundwater	WAT188	Inorganic Parameters
	LR-8A-D01D-PS	Groundwater	WAT193	Dissolved Metals
	RR-15-T02D-PS	Groundwater	WAT193	Inorganic Parameters
	RR-15-D02D-PS	Groundwater	WAT193	Dissolved Metals
	RR-15-T03D-PD	Groundwater	WAT193	Inorganic Parameters
	RR-15-D03D-PD	Groundwater	WAT193	Dissolved Metals
	LR-16-T04D-PD	Groundwater	WAT194	Inorganic Parameters
	LR-16-D04D-PD	Groundwater	WAT194	Dissolved Metals
	LR-1-T04D-PS	Groundwater	WAT195	Inorganic Parameters
	LR-1-D04D-PS	Groundwater	WAT195	Dissolved Metals
	LR-1-T04D-PD	Groundwater	WAT195	Inorganic Parameters
	LR-1-D04D-PD	Groundwater	WAT195	Dissolved Metals
GSI Sediment	RR-15-T04D-SED	Sediment	SOL094	Metals and Inorganic Parameters

6.1 FIELD DUPLICATE RESULTS

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤30% (≤50% for sediments) was applied for cases in which both the sample and sample duplicate

concentration were greater than five times the RL. For field duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than two times the greater RL (<3.5xRL for sediments). For metals data, the CRDL is used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL and the IDL, which was considered to be too low to be used as the baseline for these concentration dependent evaluations. With one exception, the applicable evaluation criterion was met. The exception and the resultant data qualifiers are summarized in the table below.

Table 6-2
Summary of Field Duplicate GSI Sample Exceedances

GSI Event	Analyte	Sample ID	Criterion	Criterion Exceedance	Action
GSI Sediment	Molybdenum	RR-15-T04N/T04D-SED	RPD≤50%	59%	J FD-I for parent samples only.

Qualification was limited to parent samples only because of small sample size (only one field duplicate was analyzed for GSI Sediments).

6.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. The rinsate blanks for the GSI Surface Water event were given field IDs of RB01T/RB01D-SFW and RB02T/RB02D-SFW. The rinsate blank for the GSI Sediment event was given a field ID of RB01T -SED. No rinsate blanks were prepared for the GSI Piezometer and GSI Chambers Water events because sampling for these events used dedicated tubing and/or disposable samplers. As two rinsate blanks were prepared and analyzed for metals, dissolved metals and inorganic parameters for 30 GSI Surface Water field sampling sites and one rinsate blank was prepared and analyzed for metals and inorganic parameters for 7 GSI Sediment field sampling sites, the QAPP frequency for rinsate blank QC samples (5%) was satisfied.

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to aqueous sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result or biasing the average high by using the reporting limit.

6.2.1 GSI Surface Water Rinsate Blank Results

Table 6-3 summarizes the detected rinsate blank results for the GSI Surface Water event.

Table 6-3
Summary of Rinsate Blank Results for GSI Surface Water

Analyte	Sample ID	Conc.	RL	Frequency of Detection	Average RB Concentration	Range for Field Samples	Number of Samples Qualified	Action
Total Metals (ug/L)								
Zinc	RB01T-SFW	3.0	2.3	1 of 2	2.1	2.0 to 134	5	U RB-I for all sample results ≤10.4 ug/L
Inorganic Parameters (mg/L)								
Bicarbonate Alkalinity	RB01T-SFW	3.2	1.0	2 of 2	2.5	57.7 to 87.5	0	U RB-I for all sample results ≤12.5 mg/L[1]
	RB02T-SFW	1.8						
Chloride	RB01T-SFW	0.52	0.20	2 of 2	0.48	1.2 to 4.1	6	U RB-I for all sample results ≤2.4 mg/L
	RB02T-SFW	0.22						
Nitrate	RB01T-SFW	0.54	0.20	1 of 2	0.32	0.20 to 0.43	29	U RB-I for all sample results ≤1.6 mg/L
Orthophosphate	RB02T-SFW	0.24	0.01	1 of 2	0.12	0.01 to 0.065	5	U RB-I for all sample results ≤0.61 mg/L
Total Alkalinity	RB01T-SFW	3.2	1.0	2 of 2	2.5	57.7 to 87.5	0	U RB-I for all sample results ≤12.5 mg/L[1]
	RB02T-SFW	1.8						
Total Dissolved Solids	RB01T-SFW	22	10	2 of 2	14	114 to 314	0	U RB-I for all sample results ≤70 mg/L[1]
	RB02T-SFW	6						
Sulfate	RB02T-SFW	5.3	5.0	1 of 2	3.9	18.1 to 130	4	U RB-I for all sample results ≤19.5 mg/L

In calculating the average rinsate blank concentration, one half of the RL was used for nondetect results.

[1] No qualification issued because all sample concentrations were greater than the qualification threshold.

While some results were required to be qualified as non-detect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and at relatively low levels.

6.2.2 GSI Sediment Rinsate Blank Results

The table below summarizes the detected rinsate blank results for the GSI Sediment event.

Table 6-4
Summary of Rinsate Blank Results for GSI Sediment

Analyte	Sample ID	Conc.	RL	Frequency of Detection	Average RB Concentration	Range for Field Samples
Inorganic Parameters (mg/L)						
Ammonia	RB01T-SED	0.06	0.04	1 of 1	0.06	12.6 to 53.6 mg/kg

Ammonia was the only analyte detected in the sediment rinsate sample. Ammonia was also detected in the majority of solid rinsate blanks for other events. As such, it was considered likely that low-levels of detected concentrations for ammonia in the sediment samples may be attributable to contamination. Evaluation of the range of detected concentrations for ammonia reported in the rinsates provides an indication of the reasonable maximum likely contribution for

each of these metals. Taking a conservative approach for calculating equivalent concentration based on the assumptions that all contamination found in the blank aliquot analyzed would be present in the sample aliquot analyzed and taking into account the differing environmental and rinsate blank preparation procedures, the maximum likely contribution for ammonia is 16.4 mg/kg. However, no sediment data have been qualified on the basis of the rinsate blank results.

6.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field blanks are only required by the QAPP when samples are analyzed for organics. Therefore, no field blanks were collected in association with the samples collected during this sample event.

On-site ammonia analyses were performed on all surface water, piezometer, and chamber water samples using an ion-selective electrode. The directions provided in the instrument manuals for the ion probe and meter were followed, with one exception. Due to volume constraints, the volume of the recommended test aliquot was scaled down from 100 ml to 10 ml. The sections below discuss the method validation and data validation conducted on the on-site ammonia data set. The on-site ammonia results are included in the database.

7.1 METHOD VALIDATION

Prior to sample analysis, a method validation study was conducted. The components of the method validation included a method detection limit study (MDL) and evaluating accuracy and precision at medium and low levels. Each component is discussed below.

MDL Study – For the MDL study, 7 replicates of a control matrix (ASTM Type II water) were spiked at a concentration of 0.1 mg/l and analyzed. The MDL study resulted in a standard deviation of 0.00439, which resulted in a calculated MDL of 0.014 mg/l. The reporting limit (RL) utilized for the on-site ammonia analysis was 0.1 mg/l. As the MDL was seven times less than the RL, the MDL study supports the selected RL.

Accuracy – Acceptable low-level and mid-level accuracy were demonstrated by the recoveries obtained for the MDL replicate samples and analysis of the continuing calibration check standards. The recoveries obtained for the 7 MDL replicates, spiked at 0.1 mg/l, ranged from 74-84%. The recoveries obtained for the 0.5 mg/l continuing calibration check standards bracketing the MDL study were 114% and 92%.

Precision – Acceptable low-level and mid-level precision were demonstrated by the standard deviation for the MDL replicate samples and analysis of the continuing calibration check standards. The standard deviation for the seven MDL replicate samples was 0.00439 with the replicate measurements ranging from 0.074 to 0.087 mg/l, resulting in a percent relative standard deviation is 5.6%. Additionally, acceptable agreement was obtained between the results for the 0.5 mg/l continuing calibration check standards bracketing the MDL study. The RPD between the results was 21%.

7.2 DATA VALIDATION

The data generated were evaluated for the following parameters: instrument performance, initial calibration, continuing calibration, method blank analysis, spike sample analysis, and duplicate sample analysis.

Sample Preservation – All samples were collected in 40 ml glass vials using a disposable 10 ml syringe. All vials contained stir bars and 40 ul of 1 M HCl. The amount of HCl to add to each vial to assure that all samples had a pH of 6 or below was determined experimentally in the field based on one of the highest pH samples available.

The pH of several samples was checked prior to analysis to evaluate if the pH was <6 as required by the instrument manual. All pH checks indicated that the amount of acid added was sufficient to lower the pH to <6. As such, the samples were sufficiently preserved so that ammonia analysis could be accurately performed.

Holding Times – All samples were analyzed within 10 days of collection, which is within the holding time limit of 28 days specified in the QAPP for acid-preserved samples.

Instrument Performance – In order to evaluate instrument performance, a slope check was done each morning prior to calibration. The slope check was conducted in accordance with the instructions in the instrument manual. The mV changes for a 1.0 to 10.0 mg/l change in sample concentration were within the acceptance range of –54 mV to –60 mV stated in the instrument manual for temperatures between 20 and 25°C.

Initial Calibration - Initial calibration was performed daily, prior to sample analysis. Calibration standards of 0.1, 0.5, 1.0 and 5.0 mg/L were used to calibrate the instrument. The instrument calibrates itself internally and there is not way to evaluate the goodness of fit to a curve. Instead, the calibration was verified by analysis of a 0.5 mg/l initial calibration check standard immediately following calibration. The recoveries of all initial calibration check standards were within the acceptance range of 90-110%.

Continuing Calibration Check Standards - Continuing calibration check standards were prepared at a concentration of 0.5 mg/l. These standards were analyzed at a frequency of 1 per 10 field samples. An acceptance range of 90-110% was used to evaluate the continuing calibration standards results and most were within this range. However, on 10-14-03, slightly low recoveries were obtained for three continuing calibration check standards. The recoveries for the second, third, and third check standard after recalibration were 86%, 80%, and 88%.

After the third check standard, the instrument was recalibrated. The re-calibration was verified by analyzing 0.5 mg/l initial calibration check standard and obtaining a 90% recovery. The third check standard after the recalibration was the closing check standard of the sequence. Immediately following this 0.5 mg/l standard, a 1.0 mg/l standard and a 5.0 mg/l standard were analyzed to further evaluate the instrument condition. Recoveries of 95% and 98%, respectively, were obtained.

Results for all samples analyzed in association with the low check standard recoveries were qualified as estimated (UJ CCV-L). Samples were not reanalyzed because of the limited volume.

Method Blank – Method blanks consisting of ASTM Type II water were analyzed at a frequency of one per ten field samples. All results were nondetect (i.e., ammonia was not detected at a reporting limit of 0.1 mg/L) and data qualification was not necessary.

Spiked Sample Analysis – Spiked samples, either laboratory control samples, matrix spike samples, or post-analytical spikes (i.e., spiking the sample after analysis and then analyzing it again after spiking), were analyzed a frequency of 1 spiked sample per 20 field samples. Spikes were done by adding 10 ml of the 5.0 ppm standards to the 10 ml sample for a true value of 2.5 ppm. However, one post-analytical spike was done by spiking with the 1.0 ppm standard which resulted in a true value of 0.5 ppm.

Recoveries for spiked samples were within the range of 92-100%, which is within the QAPP acceptance range of 75-125%. As such, the accuracy of the analyses is considered to be acceptable.

Laboratory Duplicates – Six laboratory duplicates and two field duplicates were analyzed in association with 257 field samples. All 257 field sample analyses yielded nondetect results (i.e., <0.10 mg/l). The duplicate results were also nondetect. Because nondetect results are not particularly useful in evaluation the precision of the method, precision was evaluated from the reproducibility of the continuing calibration check standards. The RPDs between the consecutive continuing calibration check standards were ≤20%, the QAPP precision acceptance limit. As such, the ongoing precision of the analyses is considered to be satisfactory.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank or rinsate blank contamination. Some sample results were qualified as estimated on the basis of the LCS or MS results or holding time exceedances. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives. A general overall assessment of each of the QAPP's data quality assurance objectives is provided below.

8.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

For the GSI Surface Water/GSI Chambers event, 100% of the field duplicate and laboratory results satisfied the applicable criteria. For the GSI Piezometer event, 100% of the field duplicate results and 99% laboratory duplicate results satisfied the applicable criteria. For the GSI Sediment event, 97% of both the field duplicate and laboratory results satisfied the applicable criteria. As such, the overall level of precision demonstrated is considered to be acceptable.

8.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery for LCS and MS samples.

All of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP, which is considered to be indicative of acceptable overall accuracy with respect to the analytical system.

The MS recoveries suggested that the overall accuracy attained with respect to the site-specific sample matrices are satisfactory as 99%, 94% and 95% of the MS recoveries for the GSI Surface Water, Piezometer and Sediment events, respectively, were within the QAPP acceptance range of 75-125%. Sample results were qualified accordingly as estimated due to low or high matrix spike recoveries.

8.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results for the 154 samples analyzed (154 field samples and 9 field duplicates) are considered usable as qualified for meeting project objective. As such, the completeness for the samples analyzed is 100%, which satisfies the QAPP completeness goal of 80%.

8.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the surface water samples. The close agreement between the field duplicate results is considered to indicate that the samples collected are adequately representative of the medium sampled. Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. As noted in Section 8.1, the laboratory duplicate results satisfied the precision evaluation indicating that sample processing and subsampling procedures were acceptable.

8.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

8.6 SENSITIVITY

All RLs obtained, except for barium, boron and cyanide results, met the QAPP specified RL requirements for aqueous media for which there was screening level criteria provided in the QAPP or the Baseline Ecological Risk Assessment to which RLs for nondetect analytes could be compared.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT187S

Sampling Event: GSI SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Brian Olmsted

Date Completed: 12/3/03

Peer Reviewer: Stacey Coker

Date Completed: 12/9/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
LR-1-T00N-SFW	SA	544531		W	X	X	X	X
LR-1-D00N-SFW	SA	544532		W	X			
LR-16-T00N-SFW	SA	544533		W	X	X	X	X
LR-16-D00N-SFW	SA	544534		W	X			
RR-15-T00N-SFW	SA	544535		W	X	X	X	X
RR-15-D00N-SFW	SA	544536		W	X			
LR-8A-T00N-SFW	SA	544537	RR-8A-T00N-SFW	W	X	X	X	X
LR-8A-D00N-SFW	SA	544538	RR-8A-D00N-SFW	W	X			
ZWERGLE-T00N-SFW	SA	544539		W	X	X	X	X
ZWERGLE -D00N-SFW	SA	544540		W	X			
ZWERGLE-T00D-SFW	FD	544541		W	X	X	X	X
ZWERGLE -D00D-SFW	FD	544542		W	X			
RR-5BB-T00N-SFW	SA	544543		W	X	X	X	X
RR-5BB-D00N-SFW	SA	544544		W	X			
RB01T-SFW	RB	544545		W	X	X	X	X
RB01D-SFW	RB	544546		W	X			
CUBE1-MID-QABLK	SA	544547		W	Ammonia Only			

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

STL Burlington noted in their case narrative that the ammonia and TOC replicate analyses associated with sample RR-5BB-T00N-SFW yielded relative percent differences that exceeded control standards. However, upon inspection, the replicate results for these analyses were within the concentration-dependent evaluation criteria specified in the RI/FS SOP 12.1.

The metals analysis of the blank spike (i.e., LCS) associated with the samples in this delivery group yielded a percent recovery for selenium that was marginally below control criteria at 74.2%. Although the associated matrix spikes exhibited acceptable percent recoveries, all selenium results were qualified as estimated (J/UJ LCS-L).

Additional issues addressed in the case narrative are summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	LR-8A-T00N-SFW and LR-8A-D00N-SFW were incorrectly logged in as RR-8A-T00N-SFW and RR-8A-D00N-SFW, respectively. The hard copy data sheets and electronic data have been corrected to reflect the correct field ID.
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. Conductivity was measured 9 days after samples were received by lab and pH was measured 4.25 hours after samples were received by lab. Table 1.1 summarizes the holding times not meeting the acceptance criteria and the resulting qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RR-5BB-T00N-SFW RR-5BB-D00N-SFW • LD RR-5BB-T00N-SFW RR-5BB-D00N-SFW	No	All MS, LD and PDS results were within the evaluation criteria standards. The matrix quality control results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-5BB-T00N-SFWS RR-5BB-D00N-SFWS • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on the matrix spike of sample RR-5BB-T00N-SFW was applicable for 21 out of 24 analytes. All applicable serial dilution analytes were within evaluation criteria. The serial dilution analysis conducted on the matrix spike of sample RR-5BB-D00N-SFW was applicable for 21 out of 24 analytes. Table 1.3 summarizes the serial dilution result outside evaluation criteria standards. The serial dilution results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Table 1.4 summarizes the total versus partial results outside the evaluation criteria and the resultant data qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion except RB01T/D-SFW which yielded a balance of –54.56%. No qualification is necessary due to the elevated RLs for nondetects which caused the imbalance because the RLs are used in the ion balance calculation for nondetect results (only two detections found in sample).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate (FD) ZWERGLE-T00D-SFW ZWERGLE-D00D-SFW • Rinsate Blank (RB) RB01T-SFW RB01D-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package did not include any field blanks or trip blanks. All field duplicate results were within the evaluation criteria standards. The field quality control results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	No	See laboratory case narrative summary.
Compound Identification	N/A	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Yes	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
LR-1-T00N-SFW	---	---	---	---	367 J	7.6 J
LR-16-T00N-SFW	---	0.28 J	---	---	321 J	7.5 J
RR-15-T00N-SFW	---	---	---	---	307 J	7.5 J
LR-8A-T00N-SFW	1.3 UJ	0.29 J	---	---	339 J	7.1 J
ZWERGLE-T00N-SFW	1.3 UJ	0.24 J	0.0050 UJ	0.010 UJ	172 J	7.6 J
ZWERGLE-T00D-SFW	1.3 UJ	0.23 J	0.0050 UJ	0.010 UJ	176 J	7.9 J
RR-5BB-T00N-SFW	1.3 UJ	0.40 J	0.0050 UJ	0.010 UJ	230 J	7.6 J
RB01T-SFW	1.3 UJ	0.54 J	---	---	0.000 J	7.0 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=1	---	-25.3	-36.0	-39.2	---	22.1	ZWERGLE-T00N-SFW ZWERGLE-D00N-SFW ZWERGLE-T00D-SFW ZWERGLE-D00D-SFW RR-5BB-D00N-SFW RB01T-SFW RB01D-SFW	UJ CCB-L or J CCB-L
Antimony (MS) DF=1	1.0	0.9	1.1	1.0	---	0.50	LR-1-T00N-SFW RR-5BB-D00N-SFW RB01T-SFW	U CCB-I
Selenium (MS) DF=1	-0.3	---	---	---	---	0.30	LR-1-T00N-SFW LR-1-D00N-SFW LR-16-T00N-SFW LR-16-D00N-SFW RR-15-T00N-SFW RR-15-D00N-SFW LR-8A-T00N-SFW LR-8A-D00N-SFW	UJ CCB-L
Molybdenum (MS) DF=1	0.7	---	---	---	0.395	0.20	RR-15-T00N-SFW RR-15-D00N-SFW ZWERGLE-T00N-SFW ZWERGLE-D00N-SFW ZWERGLE-T00D-SFW ZWERGLE-D00D-SFW RR-5BB-T00N-SFW RR-5BB-D00N-SFW	U CCB-I or U MB-I

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit IDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
RR-5BB-D00N-SFW		
Selenium	11.7	UJ DL-L

Table 1.4
Total vs. Partial Results
Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Total Metals Concentration (ug/L)	Dissolved Metals Concentration (ug/L)	RL	Criteria	Qualification Codes
LR-16-T00N-SFW & LR-16-D00N-SFW	Aluminum	151	1020	22.1	|Diff|>30%	J TvP-I
	Copper	3.1	9.7	1.7	|Diff|>2xRL	
	Iron	27.8 U	316	27.8	|Diff|>2xRL	
	Lead	0.20 U	0.62	0.2	|Diff|>2xRL	
	Zinc	53.4	106	2.3	|Diff|>30%	

RL=Reporting Limit; RL=Method Detection Limit (MDL) for Metals ND=Non-Detect

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT188S

Sampling Event: GSI SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 12/4/03

Peer Reviewer: Stacey Coker

Date Completed: 12/9/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
RR-5BB-T01N-SFW	SA	544701		W	X	X	X	X
RR-5BB-D01N-SFW	SA	544702		W	X			
RR-5BB-T01D-SFW	FD	544703		W	X	X	X	X
RR-5BB-D01D-SFW	FD	544704		W	X			
RR-15-T01N-SFW	SA	544705		W	X	X	X	X
RR-15-D01N-SFW	SA	544706		W	X			
LR-1-T01N-SFW	SA	544707		W	X	X	X	X
LR-1-D01N-SFW	SA	544708	LR-1-DO1N-SFW	W	X			
LR-16-T01N-SFW	SA	544709		W	X	X	X	X
LR-16-D01N-SFW	SA	544710		W	X			
LR-8A-T01N-SFW	SA	544711		W	X	X	X	X
LR-8A-D01N-SFW	SA	544712		W	X			
ZWERGLE-T01N-SFW	SA	544713		W	X	X	X	X
ZWERGLE-D01N-SFW	SA	544714		W	X			

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

STL Burlington noted in their case narrative that the TOC and BOD replicate analyses associated with sample RR-15-T01N-SFW yielded relative percent differences that exceeded control standards. However, upon inspection, the replicate results for these analyses were within the concentration-dependent evaluation criteria specified in the RI/FS SOP 12.1.

The nitrate analyses of the samples in this delivery group were accomplished 1 day beyond the prescribed analytical holding time due to an instrument malfunction.

Additional issues addressed in the case narrative are summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. Conductivity was measured 8 days after samples were received by lab and pH was measured 5.75 hours after samples were received by lab. Table 1.1 summarizes the holding times not meeting the acceptance criteria and the resulting qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RR-15-T01N-SFW RR-15-D01N-SFW • LD RR-15-T01N-SFW RR-15-D01N-SFW	No	All MS, PDS and LD results were within the evaluation criteria standards except for the sulfate MS result. Table 1.3 summarizes the MS result outside evaluation criteria standards. The matrix quality control results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-15-T01N-SFWS RR-15-D01N-SFWS • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on the matrix spike of sample RR-15-T01N-SFW was applicable for 21 out of 24 analytes. The serial dilution analysis conducted on the matrix spike of sample RR-15-D01N-SFW was applicable for 21 out of 24 analytes. Table 1.4 summarizes the serial dilution result outside evaluation criteria standards. The serial dilution results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Table 1.5 summarizes the total versus partial results outside the evaluation criteria and the resultant data qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) RR-5BB-T01D-SFW RR-5BB-D01D-SFW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package did not include any rinsate blanks, field blanks or trip blanks. All field duplicate results were within the evaluation criteria standards. The field quality control results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
RR-5BB-T01N-SFW	1.4 UJ	0.31 J	---	---	238 J	7.5 J
RR-5BB-T01D-SFW	1.4 UJ	0.31 J	---	---	230 J	7.7 J
RR-15-T01N-SFW	1.4 UJ	0.27 J	0.0050 UJ	---	304 J	7.2 J
LR-1-T01N-SFW	1.4 UJ	0.26 J	0.0050 UJ	0.010 UJ	325 J	7.2 J
LR-16-T01N-SFW	1.4 UJ	0.26 J	0.0050 UJ	0.010 UJ	377 J	7.5 J
LR-8A-T01N-SFW	1.4 UJ	0.26 J	0.0050 UJ	0.010 UJ	351 J	7.4 J
ZWERGLE-T01N-SFW	---	0.20 J	---	---	179 J	7.8 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=1	64.7	54.1	43.3	58.0	39.670	30.7	RR-5BB-D01N-SFW RR-5BB-D01D-SFW LR-1-D01N-SFW LR-16-D01N-SFW LR-8A-D01N-SFW ZWERGLE-T01N-SFW	U MB,CCB-I
Antimony (MS) DF=1	1.1	1.0	1.2	1.0	---	0.50	RR-5BB-T01N-SFW RR-15-D01N-SFW LR-1-T01N-SFW	U CCB-I
Beryllium (P) DF=1	-0.5	---	---	---	-0.604	0.30	All samples in this package.	UJ MB,CCB-L or UJ MB-L
Iron (P) DF=1	38.4	30.3	49.0	62.3	---	30.0	RR-5BB-D01N-SFW RR-5BB-D01D-SFW LR-1-D01N-SFW LR-8A-D01N-SFW ZWERGLE-T01N-SFW	U CCB-I
Potassium (P) DF=1	615.3	---	---	---	---	521.7	RR-5BB-T01N-SFW RR-5BB-D01N-SFW RR-5BB-T01D-SFW RR-5BB-D01D-SFW RR-15-T01N-SFW	U CCB-I
Zinc (P) DF=1	---	---	---	---	3.373	2.0	ZWERGLE-T01N-SFW ZWERGLE-D01N-SFW	U MB-I

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit IDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results
Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Sample Result (mg/L)	Matrix Spike Result (mg/L)	Spike Added	% Recovery	Qualification Codes
RR-15-T01N-SFW	Sulfate	99.0	165	100	66.0	J MS-L

RL=Reporting Limit ND=Non-Detect

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Sample	Analyte	%D	Qualification Codes
RR-15-T01N-SFW	Selenium	16.7	UJ DL-L
RR-15-D01N-SFW	Selenium	14.2	UJ DL-L

Table 1.5
Total vs. Partial Results
Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Total Metals Concentration (ug/L)	Dissolved Metals Concentration (ug/L)	RL	Criteria	Qualification Codes
LR-1-T01N-SFW & LR-1-D01N-SFW	Chromium	1.5	6.9	1.3	|Diff|>2xRL	J TvP-I

RL=Reporting Limit; RL=Method Detection Limit (MDL) for Metals ND=Non-Detect

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT189S

Sampling Event: GSI SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 12/4/03

Peer Reviewer: Stacey Coker

Date Completed: 12/9/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
LR-16-T02N-SFW	SA	545009		W	X	X	X	X
LR-16-D02N-SFW	SA	545010		W	X			
LR-8A-T02N-SFW	SA	545011		W	X	X	X	X
LR-8A-D02N-SFW	SA	545012		W	X			
RR-5BB-T02N-SFW	SA	545013		W	X	X	X	X
RR-5BB-D02N-SFW	SA	545014		W	X			
ZWERGLE-T02N-SFW	SA	545015		W	X	X	X	X
ZWERGLE-D02N-SFW	SA	545016		W	X			
LR-1-T02N-SFW	SA	545017		W	X	X	X	X
LR-1-D02N-SFW	SA	545018		W	X			
RR-15-T02N-SFW	SA	545019		W	X	X	X	X
RR-15-D02N-SFW	SA	545020		W	X			

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

Issues addressed in the case narrative are summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. Conductivity was measured 5 days after samples were received by lab and pH was measured 3.5 hours after samples were received by lab. Table 1.1 summarizes the holding times not meeting the acceptance criteria and the resulting qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	N/A	This package did not include any matrix QC analyses. The matrix quality control results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution LR-16-T02N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on sample LR-16-T02N-SFW was applicable for 3 out of 24 analytes. All applicable results were within analytical validation limits. The serial dilution results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Upon first review of data, LR-16-T02N-SFW orthophosphorous concentration was greater than 2xRL of phosphorous. However, upon review of rinsate blank detections, the orthophosphorous concentration is now determined to be the reporting limit. Therefore, total versus partial qualification is no longer valid and has been removed. Table 1.3 summarizes the total versus partial results outside the evaluation criteria and the resultant data qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package did not include any field duplicates, rinsate blanks, field blanks or trip blanks. The field quality control results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
LR-16-T02N-SFW	1.5 UJ	0.27 J	0.0050 UJ	0.052 J	391 J	7.5 J
LR-8A-T02N-SFW	1.5 UJ	0.27 J	0.0050 UJ	0.010 UJ	387 J	7.2 J
RR-5BB-T02N-SFW	1.5 UJ	0.32 J	0.0050 UJ	0.010 UJ	243 J	7.6 J
ZWERGLE-T02N-SFW	1.5 UJ	0.20 UJ	0.0050 UJ	---	185 J	7.5 J
LR-1-T02N-SFW	1.5 UJ	0.29 J	0.0050 UJ	0.010 UJ	338 J	7.1 J
RR-15-T02N-SFW	1.5 UJ	0.29 J	0.0050 UJ	0.010 UJ	329 J	7.4 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=1	---	---	35.4	---	30.7	LR-1-D02N-SFW	U CCB-I
Antimony (MS) DF=1	0.5	---	0.5	---	0.50	LR-16-T02N-SFW ZWERGLE-D02N-SFW	U CCB-I

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit IDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Results
Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Concentration[1]	RL	Criteria	Qualification Codes
RR-5BB-T02N-SFW RR-5BB-D02N-SFW	Chromium	2.2 5.0	1.3	|Diff|>2xRL	J TvP-I
	Iron	269 699	30	% Diff >30%	

RL=Reporting Limit; RL=Instrument Detection Limit (IDL) for Metals ND=Non-Detect

[1] Concentrations of metals are in units of ug/L. Concentrations of Orthophosphorous and Phosphorous are in units of mg/L

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT190S

Sampling Event: GSI SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 12/4/03

Peer Reviewer: Stacey Coker

Date Completed: 12/9/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
LR-1-T03N-SFW	SA	545021		W	X	X	X	X
LR-1-D03N-SFW	SA	545022		W	X			
RR-15-T03N-SFW	SA	545023		W	X	X	X	X
RR-15-D03N-SFW	SA	545024		W	X			
ZWERGLE-T03N-SFW	SA	545025		W	X	X	X	X
ZWERGLE-D03N-SFW	SA	545026		W	X			
RR-5BB-T03N-SFW	SA	545027		W	X	X	X	X
RR-5BB-D03N-SFW	SA	545028		W	X			
LR-16-T03N-SFW	SA	545029		W	X	X	X	X
LR-16-D03N-SFW	SA	545030		W	X			
LR-8A-T03N-SFW	SA	545031		W	X	X	X	X
LR-8A-D03N-SFW	SA	545032		W	X			

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

Issues addressed in the case narrative are summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample times for RR-15-T03N-SFW, RR-15-D03N-SFW, ZWERGLE-T03N-SFW, ZWERGLE-D03N-SFW, RR-5BB-T03N-SFW, RR-5BB-D03N-SFW were inadvertently not recorded on the COCs. STL Burlington noted that they recorded the sample times from the time written on the bottle labels.
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. Conductivity was measured 5 days after samples were received by lab and pH was measured 3.5 hours after samples were received by lab. Table 1.1 summarizes the holding times not meeting the acceptance criteria and the resulting qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	No	This package did not include any matrix QC analyses. The matrix quality control results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution LR-1-T03N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on sample LR-1-T03N-SFW was applicable for 2 out of 24 analytes. All applicable results were within analytical validation limits. The serial dilution results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Upon first review of data, LR-8A-T03N-SFW orthophosphorous concentration was greater than 2xRL of phosphorous. However, upon review of rinsate blank detections, the orthophosphorous concentration is now determined to be the reporting limit. Therefore, total versus partial qualification is no longer valid and has been removed. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package did not include any field duplicates, rinsate blanks, field blanks or trip blanks. The field quality control results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH
LR-1-T03N-SFW	323 J	7.5 J
RR-15-T03N-SFW	307 J	7.4 J
ZWERGLE-T03N-SFW	182 J	7.8 J
RR-5BB-T03N-SFW	238 J	6.9 J
LR-16-T03N-SFW	385 J	7.2 J
LR-8A-T03N-SFW	390 J	7.2 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (MS) DF=1	0.8	0.8	0.8	---	0.50	LR-1-T03N-SFW	U CCB-I
Boron (P) DF=1	6.6	---	---	---	6.3	LR-1-T03N-SFW LR-1-D03N-SFW	U CCB-I
Mercury (CV) DF=1	---	---	-0.1	0.120	0.10	ZWERGLE-T03N-SFW ZWERGLE-D03N-SFW RR-5BB-T03N-SFW RR-5BB-D03N-SFW LR-16-T03N-SFW LR-16-D03N-SFW LR-8A-T03N-SFW LR-8A-D03N-SFW	UJ CCB-L or UJ MB,CCB-I
Molybdenum (MS) DF=1	0.3	0.2	---	---	0.20	ZWERGLE-T03N-SFW ZWERGLE-D03N-SFW	U CCB-I
Sodium (P) DF=1	---	---	---	778.2	453.8	ZWERGLE-T03N-SFW ZWERGLE-D03N-SFW	U MB-I
Zinc (P) DF=1	---	---	---	2.588	2.3	ZWERGLE-D03N-SFW	U MB-I

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit IDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT191S

Sampling Event: GSI SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 12/5/03

Peer Reviewer: Stacey Coker

Date Completed: 12/9/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
ZWERGLE-T04N-SFW	SA	545241		W	X	X	X	X
ZWERGLE-D04N-SFW	SA	545242		W	X			
RR-5BB-T04N-SFW	SA	545243		W	X	X	X	X
RR-5BB-D04N-SFW	SA	545244		W	X			
RR-15-T04N-SFW	SA	545245		W	X	X	X	X
RR-15-D04N-SFW	SA	545246		W	X			
LR-1-T04N-SFW	SA	545247		W	X	X	X	X
LR-1-D04N-SFW	SA	545248		W	X			
LR-8A-T04N-SFW	SA	545249		W	X	X	X	X
LR-8A-D04N-SFW	SA	545250		W	X			
LR-16-T04N-SFW	SA	545251		W	X	X	X	X
LR-16-D04N-SFW	SA	545252		W	X			
RB02T-SFW	RB	545253		W	X	X	X	X
RB02D-SFW	RB	545254		W	X			

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

Issues addressed in the case narrative are summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample times for RR-15-T04N-SFW, RR-15-D04N-SFW, LR-1-T04N-SFW, LR-1-D04N-SFW, LR-8A-T04N-SFW, LR-8A-D04N-SFW, LR-16-T04N-SFW and LR-16-D04N-SFW were inadvertently not recorded on the COCs. The laboratory logged the samples in using the sample times on the bottle labels.
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. Conductivity was measured 4 days after samples were received by lab and pH was measured 1 day after samples were received by lab. Table 1.1 summarizes the holding times not meeting the acceptance criteria and the resulting qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	N/A	This package did not include any matrix QC analyses. The matrix quality control results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution ZWERGLE-T04N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on sample ZWERGLE-T04N-SFW was applicable for 1 out of 24 analytes. The applicable result was within analytical validation limits. The serial dilution results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Table 1.3 summarizes the total versus partial results outside the evaluation criteria and the resultant data qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion except RB02T/D-SFW which yielded a balance of –47.88%. No qualification is necessary due to the elevated RLs for nondetects which caused the imbalance because the RLs are used in the ion balance calculation for nondetected results (only four detections found in sample). The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5 except RB02T/D-SFW which yielded a value of 2.99. No qualification of TDS was given due to the TDS value being reported below the RL. If the RL is used in TDS ratio calculation, a ratio of 1.05 is found.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB02T-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	N/A	This package did not include any field duplicates, field blanks or trip blanks. The field quality control results for the GSI SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH
ZWERGLE-T04N-SFW	183 J	7.9 J
RR-5BB-T04N-SFW	237 J	7.5 J
RR-15-T04N-SFW	321 J	7.2 J
LR-1-T04N-SFW	329 J	7.3 J
LR-8A-T04N-SFW	386 J	7.4 J
LR-16-T04N-SFW	385 J	7.6 J
RB02T-SFW	0.000 J	7.4 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=1	---	---	24.9	-28.440	22.1	ZWERGLE-T04N-SFW WERGLE-D04N-SFW RR-5BB-D04N-SFW LR-1-D04N-SFW LR-8A-D04N-SFW LR-16-D04N-SFW	UJ MB-L or J MB-L or UJ MB,CCB-I
Antimony (MS) DF=1	0.7	---	0.6	---	0.50	ZWERGLE-T04N-SFW	U CCB-I
Iron (P) DF=1	33.1	---	50.0	---	27.8	RR-5BB-D04N-SFW RR-15-D04N-SFW	U CCB-I
Mercury (CV) DF=1	-0.1	---	0.2	---	0.10	ZWERGLE-T04N-SFW ZWERGLE-D04N-SFW RR-5BB-T04N-SFW RR-5BB-D04N-SFW RR-15-T04N-SFW RR-15-D04N-SFW LR-1-T04N-SFW LR-8A-D04N-SFW RB02T-SFW RB02D-SFW	UJ CCB-L or J CCB-L or U CCB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Selenium (MS) DF=1	0.4	0.3	---	---	0.30	ZWERGLE-D04N-SFW RR-5BB-D04N-SFW RR-15-T04N-SFW RR-15-D04N-SFW LR-1-T04N-SFW LR-1-D04N-SFW LR-8A-T04N-SFW LR-8A-D04N-SFW LR-16-T04N-SFW LR-16-D04N-SFW RB02T-SFW	U CCB-I
Sodium (P) DF=1	---	473.7	---	807.200	453.8	ZWERGLE-T04N-SFW ZWERGLE-D04N-SFW RB02T-SFW	U MB-I or U MB,CCB-I
Zinc (P) DF=1	---	---	---	7.658	2.3	ZWERGLE-T04N-SFW ZWERGLE-D04N-SFW RR-5BB-T04N-SFW RR-5BB-D04N-SFW	U MB-I

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit IDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Results
Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Concentration (mg/L)	RL	Criteria	Qualification Codes
RB02T-SFW	Orthophosphorous	0.24	0.010	|Diff|>2xRL	J TvP-I
	Phosphorous	0.010	0.010		UJ TvP-I

RL=Reporting Limit

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT192S

Sampling Event: GSI Piezometers

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Brian Olmsted

Date Completed: 12/8/03

Peer Reviewer: Stacey Coker

Date Completed: 12/9/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics[3]
ZWERGLE-T00N-PS	SA	545513		W		X
ZWERGLE-D00N-PS	SA	545514		W	X	
ZWERGLE-T00N-PD	SA	545515		W		X
ZWERGLE-D00N-PD	SA	545516		W	X	
RR-5BB-T00N-PS	SA	545517		W		X
RR-5BB-D00N-PS	SA	545518		W	X	
RR-5BB-T00N-PD	SA	545519		W		X
RR-5BB-D00N-PD	SA	545520		W	X	
RR-15-T00N-PS	SA	545521		W		X
RR-15-D00N-PS	SA	545522		W	X	
RR-15-T00N-PD	SA	545523		W		X
RR-15-D00N-PD	SA	545524		W	X	
LR-1-T00N-PS	SA	545525		W		X
LR-1-D00N-PS	SA	545526		W	X	
LR-1-T00N-PD	SA	545527		W		X
LR-1-D00N-PD	SA	545528		W	X	
LR-8A-T00N-PS	SA	545529		W		X
LR-8A-D00N-PS	SA	545530		W	X	
LR-8A-T00N-PD	SA	545531		W		X
LR-8A-D00N-PD	SA	545532		W	X	
LR-16-T00N-PS	SA	545533		W		X
LR-16-D00N-PS	SA	545534		W	X	
LR-16-T00N-PD	SA	545535		W		X
LR-16-D00N-PD	SA	545536		W	X	
ZWERGLE-T01N-PS	SA	545537		W		X
ZWERGLE-D01N-PS	SA	545538		W	X	
ZWERGLE-T01N-PD	SA	545539		W		X
ZWERGLE-D01N-PD	SA	545540		W	X	
RR-5BB-T01N-PS	SA	545541		W		X
RR-5BB-D01N-PS	SA	545542		W	X	

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics[3]
RR-5BB-T01N-PD	SA	545543		W		X
RR-5BB-D01N-PD	SA	545544		W	X	
RR-15-T01N-PS	SA	545545		W		X
RR-15-D01N-PS	SA	545546		W	X	
RR-15-T01N-PD	SA	545547		W		X
RR-15-D01N-PD	SA	545548		W	X	
LR-1-T01N-PS	SA	545549		W		X
LR-1-D01N-PS	SA	545550		W	X	
LR-1-T01N-PD	SA	545551		W		X
LR-1-D01N-PD	SA	545552		W	X	

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.
[3]In accordance with the sampling plan, inorganic parameters for this study were limited to fluoride, sulfate and TOC due to the limited sample volume available.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

STL Burlington noted that the date of analysis was incorrectly recorded in the raw data for analytical sequence 03102718.500 by the analyst. The analyst discovered this error and noted the correct date. The data reviewer corrected the date on the run log.

Any additional issues addressed in the case narrative are summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS LR-1-T00N-PS LR-1-D00N-PS RR-15-T01N-PD RR-15-D01N-PD • LD LR-1-T00N-PD LR-1-D00N-PD LR-1-T01N-PS LR-1-D01N-PS	No	Table 1.2 summarizes the MS results outside the evaluation criteria and resultant data qualification. Two post digestion spike (PDS) results were outside control limits, however, because MS results for these analytes were well within control limits, no qualification for PDS was deemed necessary. The matrix quality control results for the GSI Piezometer sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution LR-1-D00N-PSS RR-15-D01N-PDS • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on the matrix spike of sample LR-1-D00N-PS was applicable for 22 out of 24 analytes. The serial dilution analysis conducted on the matrix spike of sample RR-15-D01N-PD was applicable for 22 out of 24 analytes. Table 1.3 summarizes the serial dilution result outside evaluation criteria standards. The serial dilution results for the GSI Piezometer sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Cation/Anion balance calculations were not done because the analyte list did not include all of the necessary constituents.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	N/A	This package did not include any field duplicates, rinsate blanks, field blanks or trip blanks. The field quality control results for the GSI Piezometer sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	No	See verification section below.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	No	Table 1.4 summarizes the continuing calibration verification detection and the resultant data qualifications.
Laboratory Control Sample Results	Yes	
Compound Identification	N/A	
Quantification	Yes	
Verification	No	Sulfate values are reported for 545513, 545515, 545517, 545519, 545521 and 545523, however, these samples are not displayed on the sulfate calculation sheet. Therefore there is no way to verify the sulfate values for these samples based on the report that is given.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Yes	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=1	-112.0	-75.4	-170.9	-49.2	N/A	-152.300	21.7	ZWERGLE-D00N-PS ZWERGLE-D00N-PD RR-15-D00N-PD LR-1-D00N-PS LR-1-D00N-PD LR-8A-D00N-PS LR-8A-D00N-PD LR-16-D00N-PS LR-16-D00N-PD ZWERGLE-D01N-PS ZWERGLE-D01N-PD RR-15-D01N-PD LR-1-D01N-PS LR-1-D01N-PD	UJ MB,CCB-L or J MB,CCB-L
Antimony (MS) DF=1	0.7	0.7	0.7	0.7	0.7	0.564	0.50	ZWERGLE-D00N-PS LR-1-D00N-PD ZWERGLE-D01N-PD LR-1-D01N-PS	U MB, CCB-I
Beryllium (P) DF=1	2.1	3.9	3.9	4.0	---	---	0.4	RR-5BB-D00N-PS RR-5BB-D00N-PD RR-15-D00N-PS RR-5BB-D01N-PS RR-5BB-D01N-PD RR-15-D01N-PS RR-15-D01N-PD	U CCB-I
Iron (P) DF=1	55.4	31.7	29.4	---	---	---	27.8	ZWERGLE-D00N-PS ZWERGLE-D00N-PD RR-5BB-D00N-PS RR-5BB-D00N-PD RR-15-D00N-PD LR-1-D00N-PS LR-1-D00N-PD LR-8A-D00N-PS LR-16-D00N-PS LR-16-D00N-PD ZWERGLE-D01N-PD RR-5BB-D01N-PS RR-5BB-D01N-PD RR-15-D01N-PS	U CCB-I
Molybdenum (MS) DF=1	---	---	0.3	---	---	---	0.20	RR-15-D00N-PS ZWERGLE-D01N-PS ZWERGLE-D01N-PD RR-15-D01N-PS	U CCB-I
Potassium (P) DF=1	-1875.0	-3795.0	-3814.0	-4151.0	---	---	318.0	All samples in this package.	J CCB-L
Sodium (P) DF=1	---	711.8	674.9	661.1	---	---	453.8	ZWERGLE-D00N-PS ZWERGLE-D00N-PD ZWERGLE-D01N-PS ZWERGLE-D01N-PD	U CCB-I

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit IDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike Results
Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Sample Result (mg/L)	Matrix Spike Result (mg/L)	Spike Added (mg/L)	% Recovery	Qualification Codes
LR-1-T00N-PS	Sulfate	73.4	135	100	62	J MS-L
RR-15-T01N-PD		142	199		57	

RL=Reporting Limit ND=Non-Detect

Table 1.3
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
LR-1-D00N-PS		
Aluminum	10.5	UJ DL-H

Table 1.4
Continuing Calibration Verification Resulting in Qualification

Analyte	CCV5 %R	Samples Qualified	Qualification Codes
Antimony (MS) DF=1	89.4	ZWERGLE-D00N-PS ZWERGLE-D00N-PD RR-5BB-D00N-PS RR-5BB-D00N-PD RR-15-D00N-PS RR-15-D00N-PD LR-1-D00N-PS LR-1-D00N-PD LR-8A-D00N-PS	J/UJ CCV-L

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank
IDL=Instrument Detection Limit RL= Reporting LimitIDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT193S

Sampling Event: GSI Piezometers

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 12/8/03

Peer Reviewer: Stacey Coker

Date Completed: 12/9/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics[3]
LR-8A-T01N-PS	SA	545582		W		X
LR-8A-D01N-PS	SA	545583		W	X	
LR-8A-T01N-PD	SA	545584		W		X
LR-8A-D01N-PD	SA	545585		W	X	
LR-16-T01N-PS	SA	545586		W		X
LR-16-D01N-PS	SA	545587		W	X	
LR-16-T01N-PD	SA	545588		W		X
LR-16-D01N-PD	SA	545589		W	X	
LR-8A-T01D-PS	FD	545590		W		X
LR-8A-D01D-PS	FD	545591		W	X	
ZWERGLE-T02N-PS	SA	545592		W		X
ZWERGLE-D02N-PS	SA	545593		W	X	
ZWERGLE-T02N-PD	SA	545594		W		X
ZWERGLE-D02N-PD	SA	545595		W	X	
RR-5BB-T02N-PS	SA	545596		W		X
RR-5BB-D02N-PS	SA	545597		W	X	
RR-5BB-T02N-PD	SA	545598		W		X
RR-5BB-D02N-PD	SA	545599		W	X	
RR-15-T02N-PS	SA	545600		W		X
RR-15-D02N-PS	SA	545601		W	X	
RR-15-T02N-PD	SA	545602		W		X
RR-15-D02N-PD	SA	545603		W	X	
RR-15-T02D-PS	FD	545604		W		X
RR-15-D02D-PS	FD	545605		W	X	
ZWERGLE-T03N-PS	SA	545606		W		X
ZWERGLE-D03N-PS	SA	545607		W	X	
ZWERGLE-T03N-PD	SA	545608		W		X
ZWERGLE-D03N-PD	SA	545609		W	X	
RR-5BB-T03N-PS	SA	545610		W		X
RR-5BB-D03N-PS	SA	545611		W	X	

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics[3]
RR-5BB-T03N-PD	SA	545612		W		X
RR-5BB-D03N-PD	SA	545613		W	X	
RR-15-T03N-PS	SA	545614		W		X
RR-15-D03N-PS	SA	545615		W	X	
RR-15-T03N-PD	SA	545616		W		X
RR-15-D03N-PD	SA	545617		W	X	
RR-15-T03D-PD	FD	545618		W		X
RR-15-D03D-PD	FD	545619		W	X	
LR-1-T02N-PS	SA	545620		W		X
LR-1-D02N-PS	SA	545621		W	X	

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

[3]In accordance with the sampling plan, inorganic parameters for this study were limited to fluoride, sulfate and TOC due to the limited sample volume available.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

STL Burlington incorrectly noted that the matrix spike recoveries for RR-5BB-D02N-PS of arsenic, cadmium, selenium and molybdenum were outside control limits when molybdenum was the only analyte outside. STL Burlington also incorrectly noted that the serial dilution results for RR-5BB-D02N-PS was only outside for molybdenum, when in fact arsenic, cadmium and selenium were also outside control limits.

STL Burlington incorrectly noted that the matrix spike recoveries for ZWERGLE-D03N-PD of arsenic and selenium were outside control limits when silver was the only analyte outside. STL Burlington also incorrectly noted that serial dilution results for ZWERGLE-D03N-PD was only outside for silver, when in fact arsenic and selenium were the only analytes outside the control limits.

STL Burlington noted that during the metals analyses for ICAP 6 on 11/8/03, the linear range verification standard yielded percent recoveries for iron, potassium, magnesium and sodium that slightly exceeded control criteria. The recoveries for iron, potassium, magnesium and sodium were 110.0%, 108.6%, 110.2% and 108.4%, respectively outside the acceptance range of 95-105%. Only sample RR-5BB-D02N-PS was analyzed on 11/8/03. The concentrations of these elements in the associated field samples were well below the concentrations in the linear range standards. In addition, the continuing calibration verification (CCV) for these elements were within the control criteria and the concentrations in the field sample were also below CCV concentrations. Therefore, data qualification on the basis of the linear range standard was not considered necessary.

Any additional issues addressed in the case narrative are summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample RR-15-T03D-PS was incorrectly written on COC as RR-15-T03D-PD. STL Burlington noted problem on sample log-in sheet based on label ID.
Holding Times	Yes	
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RR-5BB-T02N-PS RR-5BB-D02N-PS ZWERGLE-T03N-PD ZWERGLE-D03N-PD • LD RR-5BB-T02N-PD RR-5BB-D02N-PD RR-5BB-T03N-PS RR-5BB-D03N-PS	No	Table 1.2 summarizes the MS results outside the evaluation criteria and resultant data qualification. Two post digestion spike (PDS) results were outside control limits, however, because MS results for these analytes were well within control limits, no qualification for PDS was deemed necessary. All LD results were within the evaluation criteria guidelines. The matrix quality control results for the GSI Piezometer sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-5BB-D02N-PSS ZWERGLE-D03N-PDS • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on the matrix spike of sample RR-5BB-D02N-PS was applicable for 22 out of 24 analytes. The serial dilution analysis conducted on the matrix spike of sample ZWERGLE-D03N-PD was applicable for 21 out of 24 analytes. Table 1.3 summarizes the serial dilution result outside evaluation criteria standards. The serial dilution results for the GSI Piezometer sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Table 1.4 summarizes the internal standard results outside evaluation criteria limits. Cation/Anion balance calculations were not done because the analyte list did not include all of the necessary constituents.
Field QC • Field Duplicate (FD) LR-8A-T01D-PS LR-8A-D01D-PS RR-15-T02D-PS RR-15-D02D-PS RR-15-T03D-PD RR-15-D03D-PD • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package did not include any rinsate blanks, field blanks or trip blanks. All field duplicate samples were within the evaluation criteria guidelines. The field quality control results for the GSI Piezometer sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=1	---	51.6	47.1	40.8	32.480	22.1	LR-8A-D01N-PS ZWERGLE-D03N-PD	U MB,CCB-I
Antimony (MS) DF=1	1.1	1.0	1.0	1.0	0.783	0.50	LR-8A-D01N-PS LR-8A-D01N-PD RR-5BB-D02N-PD ZWERGLE-D03N-PS ZWERGLE-D03N-PD RR-5BB-D03N-PS RR-15-D03N-PS RR-15-D03D-PD	U MB,CCB-I
Copper (MS) DF=1	---	---	---	---	11.231	1.70	LR-8A-D01N-PS LR-8A-D01N-PD LR-16-D01N-PS LR-16-D01N-PD LR-8A-D01D-PS ZWERGLE-D02N-PS ZWERGLE-D02N-PD RR-15-D02N-PS RR-15-D02N-PD RR-15-D02D-PS ZWERGLE-D03N-PS ZWERGLE-D03N-PD RR-15-D03N-PS RR-15-D03N-PD RR-15-D03D-PD LR-1-D02N-PS	U MB-I
Iron (P) DF=1	---	40.0	67.4	47.9	---	27.8	LR-8A-D01N-PS RR-5BB-D02N-PD RR-15-D02N-PD RR-5BB-D03N-PS RR-15-D03N-PD RR-15-D03D-PD	U CCB-I
Iron (P) DF=1	-76.9	-43.3	---	N/A		30.0	RR-5BB-D03N-PD	J CCB-L
Molybdenum (MS) DF=1	0.9	0.3	0.3	0.3	0.556	0.20	ZWERGLE-D02N-PS ZWERGLE-D02N-PD RR-15-D02N-PS RR-15-D02N-PD RR-15-D02D-PS ZWERGLE-D03N-PS ZWERGLE-D03N-PD RR-15-D03N-PS RR-15-D03N-PD RR-15-D03D-PD	U MB,CCB-I or U MB-I
Zinc (P) DF=1	---	---	---	---	6.359	2.3	LR-16-D01N-PS	U MB-I

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit IDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike Results
Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Sample Result (ug/L)	Matrix Spike Result (ug/L)	Spike Added (ug/L)	% Recovery	Qualification Codes
ZWERGLE-T03N-PD	Sulfate	0.0194	0.0342	0.020	74.0	J MS-L
RR-5BB-D02N-PS	Molybdenum	0.2000 U	149.2171	200.00	74.6	UJ MS-L

RL=Reporting Limit ND=Non-Detect

Table 1.3
Serial Dilutions Resulting in
Parent Sample Qualifications

Sample	Analyte	%D	Qualification Codes
RR-5BB-D02N-PS	Arsenic	11.1	UJ DL-L
	Cadmium	12.8	J DL-L
	Selenium	22.3	J DL-L
	Molybdenum	31.3	UJ DL-L
ZWERGLE-D03N-PD	Arsenic	13.0	UJ DL-L
	Selenium	10.6	UJ DL-L

Table 1.4
Internal Standard Results
Not Meeting Acceptance Criteria and Data Qualification

Sample	%RI for Y	Criteria	Analytes Affected	Qualification Codes
RR-5BB-D02N-PS	128.6	30-120%	Beryllium & Molybdenum	J/UJ IS-I
RR-5BB-D02N-PD	130.0			
RR-5BB-D03N-PS	132.2			
RR-5BB-D03N-PD	132.2			

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT194S

Sampling Event: GSI Piezometers

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Brian Olmsted

Date Completed: 12/9/03

Peer Reviewer: Stacey Coker

Date Completed: 12/9/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics[3]
LR-1-T02N-PD	SA	545647		W		X
LR-1-D02N-PD	SA	545648		W	X	
LR-8A-T02N-PS	SA	545649		W		X
LR-8A-D02N-PS	SA	545650		W	X	
LR-8A-T02N-PD	SA	545651		W		X
LR-8A-D02N-PD	SA	545652		W	X	
LR-16-T02N-PS	SA	545653		W		X
LR-16-D02N-PS	SA	545654		W	X	
LR-16-T02N-PD	SA	545655		W		X
LR-16-D02N-PD	SA	545656		W	X	
LR-1-T03N-PS	SA	545657		W		X
LR-1-D03N-PS	SA	545658		W	X	
LR-1-T03N-PD	SA	545659		W		X
LR-1-D03N-PD	SA	545660		W	X	
LR-8A-T03N-PS	SA	545661		W		X
LR-8A-D03N-PS	SA	545662		W	X	
LR-8A-T03N-PD	SA	545663		W		X
LR-8A-D03N-PD	SA	545664		W	X	
LR-16-T03N-PS	SA	545665	LR-160T03N-PS	W		X
LR-16-D03N-PS	SA	545666		W	X	
LR-16-T03N-PD	SA	545667		W		X
LR-16-D03N-PD	SA	545668		W	X	
ZWERGLE-T04N-PS	SA	545669		W		X
ZWERGLE-D04N-PS	SA	545670		W	X	
ZWERGLE-T04N-PD	SA	545671		W		X
ZWERGLE-D04N-PD	SA	545672		W	X	
RR-5BB-T04N-PS	SA	545673		W		X
RR-5BB-D04N-PS	SA	545674		W	X	
RR-5BB-T04N-PD	SA	545675		W		X
RR-5BB-D04N-PD	SA	545676		W	X	
RR-15-T04N-PS	SA	545677		W		X
RR-15-D04N-PS	SA	545678		W	X	

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics[3]
RR-15-T04N-PD	SA	545679		W		X
RR-15-D04N-PD	SA	545680		W	X	
LR-16-T04D-PD	FD	545681		W		X
LR-16-D04D-PD	FD	545682		W	X	

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.
[3]In accordance with the sampling plan, inorganic parameters for this study were limited to fluoride, sulfate and TOC due to the limited sample volume available.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

Sulfate reanalyses were performed on samples LR-1-T02N-PD, LR-8A-T02N-PS, LR-8A-T03N-PS, ZWERGLE-T04N-PS, ZWERGLE-T04N-PD and RR-5BB-T04N-PS which initially exhibited extremely elevated results. The reanalyses were performed outside the analytical holding time and were therefore qualified with a bias direction of indeterminate (J HT-I). The sulfate reanalyses performed for sulfate replace the original results supplied in WAT194S.

STL Burlington noted that the replicate TOC analysis for LR-16-T03N-PS yielded a RPD that exceeded control criteria. However, upon inspection, the replicate result was within the concentration-dependent evaluation criteria specified in the RI/FS SOP 12.1.

Any additional issues addressed in the case narrative are summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	See case narrative summary above.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS LR-16-T03N-PS LR-16-D03N-PS • LD LR-16-T03N-PS LR-16-T03N-PD LR-16-D03N-PD	No	Table 1.2 summarizes the MS results outside the evaluation criteria and resultant data qualification. Two post digestion spike (PDS) results were outside control limits. For one of the results the MS results for the analyte was well within control limits, therefore no qualification for PDS was deemed necessary. For the other PDS analyte, the result was greater than four times the spike concentration, therefore no qualification for PDS was made. Table 1.3 summarizes the laboratory duplicate results outside evaluation criteria standards. The matrix quality control results for the GSI Piezometer sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution LR-16-D03N-PSS • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on the matrix spike of sample LR-16-D03N-PS was applicable for 23 out of 24 analytes. Table 1.4 summarizes the serial dilution result outside evaluation criteria standards. The serial dilution results for the GSI Piezometer sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Table 1.5 summarizes the internal standard results outside evaluation criteria limits. Cation/Anion balance calculations were not done because the analyte list did not include all of the necessary constituents.
Field QC • Field Duplicate (FD) LR-16-T04D-PD LR-16-D04D-PD • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package did not include any rinsate blanks, field blanks or trip blanks. The field duplicate associated sample is reported in package WAT195S. Upon inspection, the field duplicate sample results were within the evaluation criteria guidelines. The field quality control results for the GSI Piezometer sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=1	41.2	---	31.2	41.0	---	30.7	LR-8A-D02N-PS LR-16-D03N-PD	U CCB-I
Boron (P) DF=1	6.9	---	---	---	---	6.4	LR-8A-D03N-PS	U CCB-I
Iron (P) DF=1	---	---	---	37.3	---	30.0	RR-5BB-D04N-PD RR-15-D04N-PD	U CCB-I
Molybdenum (P) DF=1	2.7	4.4	4.4	2.6	---	1.2	LR-1-D02N-PD LR-1-D03N-PS LR-1-D03N-PD ZWERGLE-D04N-PS ZWERGLE-D04N-PD RR-5BB-D04N-PD RR-15-D04N-PS RR-15-D04N-PD	U CCB-I

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Potassium (P) DF=1	619.9	---	-765.4	---	673.500	521.7	LR-1-D02N-PD LR-8A-D02N-PS LR-8A-D02N-PD LR-16-D02N-PS LR-16-D02N-PD LR-1-D03N-PS LR-1-D03N-PD LR-8A-D03N-PS LR-8A-D03N-PD ZWERGLE-D04N-PS ZWERGLE-D04N-PD RR-5BB-D04N-PS RR-5BB-D04N-PD RR-15-D04N-PS RR-15-D04N-PD RR-16-D04D-PD	U MB, CCB-I or U MB-I or UJ MB, CCB-I or UJ CCB-L

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit IDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Sample Result (ug/L)	Matrix Spike Result (ug/L)	Spike Added (ug/L)	% Recovery	Qualification Codes
LR-16-D03N-PS	Antimony	0.5000 U	83.3276	200.00	41.7	UJ MS-L
	Selenium	1.5124	15.0469	20.00	67.7	J MS-L

RL = Reporting Limit ND = Non-Detect

Table 1.3
Laboratory Duplicate Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Result (ug/L)	Duplicate Result (ug/L)	CRDL	RPD	Criteria	Qualification Codes
LR-16-D03N-PD	Lead	3.4942	0.2000 U	2.0	200.0	|Diff|>RL	J D-I

RL = Reporting Limit ND = Non-Detect

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Sample	Analyte	%D	Qualification Codes
LR-16-D03N-PS	Arsenic	14.4	J DL-L
	Selenium	24.1	J DL-L

Table 1.5
Internal Standard Results Not Meeting Acceptance Criteria and Data Qualification

Sample	%RI for Sc	%RI for Y	Criteria	Analytes Affected	Qualification Codes
LR-16-D03N-PS	---	143.9	30-120%	Be, Mo	J/UJ IS-I
ZWERGLE-D04N-PS	120.6	---		Se, V	
ZWERGLE-D04N-PD	122.3	---			
RR-5BB-D04N-PS	---	136.6		Be, Mo	
RR-5BB-D04N-PD	---	138.4		Be, Mo	

For the sake of brevity the table is limited to those internal standard results that indicated qualification.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT194SA

Sampling Event: GSI Piezometers

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Stacey Coker

Date Completed: 03/03/04

Peer Reviewer: Alan Roberts

Date Completed: 03/03/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Laboratory Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics
LR-16-D03N-PS	SA	561687		W	X	

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

This package represents an addendum to the original package WAT194S. At the client's request, STL-B investigated the condition of the containers submitted for the sample collected at location LR-16 on Day 3 of the study. The container provided for the dissolved metals analysis was turbid and contained solids that collected on the bottom of the container whereas the container provided for the fluoride and sulfate analysis was clear and had a pH< 2 rather than the native pH of the composite sample which would be expected to be around 6.6. As such, it was apparent that the labels for these containers were accidentally reversed. While the sulfate and fluoride results were not affected, the original dissolved metals analysis reported in WAT194S was conducted on the bottle containing the unfiltered sample and the results are likely biased high due to the solids present in the sample. The laboratory performed an analysis of metals on the filtered sample and the results are presented in this package, WAT194SA. Any additional issues potentially affecting data quality are summarized in the following tables.

Based on the review of this package, the dissolved metals results for sample LR-16-D03N-PS reported in this package were selected for reporting and the original dissolved metals results reported in WAT194S were rejected. The data sheets have been marked accordingly.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For the reanalysis of sample LR-16-D03N-PS, the mercury holding time of 28 days was exceeded. As such, the mercury result was qualified as estimated (UJ HT – I).
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	Matrix QC analyses were not included in this package. The matrix quality control results for the GSI Piezometer sampling event were evaluated collectively and any resultant data qualification is summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution LR-16-D03N-PSL • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on the matrix spike of sample LR-16-D03N-PS was applicable for 3 of the 24 analytes (calcium, molybdenum, and vanadium). The %D for vanadium was 12.1%, exceeding the acceptance limit of ≤10%. As such, the vanadium result for sample LR-16-D03N-PS was qualified as estimated (J DL – L). The serial dilution results for the GSI Piezometer sampling event were evaluated collectively and any resultant data qualification is summarized in the overall assessment. Cation/Anion balance calculations were not done because the analyte list did not include all of the necessary constituents. The only anions analyzed were fluoride and sulfate.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package did not include any rinsate blanks, field blanks, or field duplicates. The field quality control results for the GSI Piezometer sampling event were evaluated collectively and any resultant data qualification is summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Copper (MS)	-0.8	-0.8	-0.561	0.30	LR-16-D03N-PS	UJ MB, CCB-L
Nickel (MS)	-1.1	-1.2	-0.942	0.20		J MB, CCB-L
Selenium (MS)			-0.344	0.20		J MB-L
Silver (MS)	-0.2	-0.1	-0.156	0.10		UJ MB, CCB-L

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit IDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT195S

Sampling Event: GSI Piezometers

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 12/10/03

Peer Reviewer: Stacey Coker

Date Completed: 12/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics[3]
LR-1-T04N-PS	SA	545683		W		X
LR-1-D04N-PS	SA	545684		W	X	
LR-1-T04N-PD	SA	545685		W		X
LR-1-D04N-PD	SA	545686		W	X	
LR-8A-T04N-PS	SA	545687		W		X
LR-8A-D04N-PS	SA	545688		W	X	
LR-8A-T04N-PD	SA	545689		W		X
LR-8A-D04N-PD	SA	545690		W	X	
LR-16-T04N-PS	SA	545691		W		X
LR-16-D04N-PS	SA	545692		W	X	
LR-16-T04N-PD	SA	545693		W		X
LR-16-D04N-PD	SA	545694		W	X	
LR-1-T04D-PS	FD	545695		W		X
LR-1-D04D-PS	FD	545696		W	X	
LR-1-T04D-PD	FD	545697		W		X
LR-1-D04D-PD	FD	545698		W	X	

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

[3]In accordance with the sampling plan, inorganic parameters for this study were limited to fluoride, sulfate and TOC due to the limited sample volume available.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

Issues addressed in the case narrative are summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS LR-8A-T04N-PD LR-8A-D04N-PD • LD LR-16-T04N-PS LR-16-D04N-PS	No	Table 1.2 summarizes the MS results outside the evaluation criteria and resultant data qualification. One post digestion spike (PDS) result was outside control limits. The MS result for the analyte was well within control limits, therefore no qualification for PDS was deemed necessary. The matrix quality control results for the GSI Piezometer sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution LR-8A-D04N-PDS • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on the matrix spike of sample LR-8A-D04N-PS was applicable for 23 out of 24 analytes. Table 1.3 summarizes the serial dilution result outside evaluation criteria standards. The serial dilution results for the GSI Piezometer sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Cation/Anion balance calculations were not done because the analyte list did not include all of the necessary constituents.
Field QC • Field Duplicate (FD) LR-1-T04D-PS LR-1-D04D-PS LR-1-T04D-PD LR-1-D04D-PD • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package did not include any rinsate blanks, field blanks or trip blanks. The field quality control results for the GSI Piezometer sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (MS) DF=1	1.1	0.8	1.0	0.696	0.50	LR-1-D04N-PS LR-1-D04N-PD LR-16-D04N-PS LR-16-D04N-PD LR-1-D04D-PD	U MB,CCB-I
Beryllium (P) DF=1	---	---	0.6	0.447	0.3	LR-1-D04N-PD LR-8A-D04N-PS LR-8A-D04N-PD LR-16-D04N-PD LR-1-D04D-PS LR-1-D04D-PD	U MB-I or U MB,CCB-I
Chromium (P) DF=1	-1.6	-3.2	---	---	1.3	All samples in this package.	J/UJ CCB-L
Molybdenum (P) DF=1	-1.9	---	-3.0	---	1.2	LR-1-D04N-PS LR-1-D04N-PD LR-1-D04D-PS LR-1-D04D-PD	J CCB-L

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit IDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike Results
Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Sample Result (mg/L)	Matrix Spike Result (mg/L)	Spike Added (mg/L)	% Recovery	Qualification Codes
LR-8A-T04N-PD	TOC	1.9	10.3	5.00	168.0	J MS-H

RL=Reporting Limit ND=Non-Detect

Table 1.3
Serial Dilutions Resulting in Parent Sample Qualifications

Sample	Analyte	%D	Qualification Codes
LR-8A-D04N-PD	Arsenic	13.6	J DL-L
	Boron	12.5	J DL-L
	Cadmium	17.3	UJ DL-L
	Iron	11.5	UJ DL-L
	Selenium	10.8	J DL-L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT197S

Sampling Event: GSI Chamber Water

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 12/11/03

Peer Reviewer: Stacey Coker

Date Completed: 12/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics[3]
ZWERGLE-T01N-ASC	SA	545858		W		X
ZWERGLE-D01N-ASC	SA	545859		W	X	
ZWERGLE-T01N-WCC	SA	545860		W		X
ZWERGLE-D01N-WCC	SA	545861		W	X	
RR-5BB-T01N-ASC	SA	545862		W		X
RR-5BB-D01N-ASC	SA	545863		W	X	
RR-5BB-T01N-WCC	SA	545864		W		X
RR-5BB-D01N-WCC	SA	545865		W	X	
RR-15-T01N-ASC	SA	545866		W		X
RR-15-D01N-ASC	SA	545867		W	X	
RR-15-T01N-WCC	SA	545868		W		X
RR-15-D01N-WCC	SA	545869		W	X	
LR-1-T01N-ASC	SA	545870		W		X
LR-1-D01N-ASC	SA	545871		W	X	
LR-1-T01N-WCC	SA	545872		W		X
LR-1-D01N-WCC	SA	545873		W	X	
LR-8A-T01N-ASC	SA	545874		W		X
LR-8A-D01N-ASC	SA	545875		W	X	
LR-8A-T01N-WCC	SA	545876		W		X
LR-8A-D01N-WCC	SA	545877		W	X	
LR-16-T01N-ASC	SA	545878		W		X
LR-16-D01N-ASC	SA	545879		W	X	
LR-16-T01N-WCC	SA	545880		W		X
LR-16-D01N-WCC	SA	545881		W	X	
ZWERGLE-T02N-WCC	SA	545882		W		X
ZWERGLE-D02N-WCC	SA	545883		W	X	
ZWERGLE-T02N-ASC	SA	545884		W		X
ZWERGLE-D02N-ASC	SA	545885		W	X	
LR-1-T02N-WCC	SA	545886		W		X
LR-1-D02N-WCC	SA	545887		W	X	

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics[3]
LR-1-T02N-ASC	SA	545888		W		X
LR-1-D02N-ASC	SA	545889		W	X	
RR-5BB-T02N-WCC	SA	545890		W		X
RR-5BB-D02N-WCC	SA	545891		W	X	
RR-5BB-T02N-ASC	SA	545892		W		X
RR-5BB-D02N-ASC	SA	545893		W	X	
LR-8A-T02N-WCC	SA	545894		W		X
LR-8A-D02N-WCC	SA	545895		W	X	
LR-8A-T02N-ASC	SA	545896		W		X
LR-8A-D02N-ASC	SA	545897		W	X	

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

[3]In accordance with the sampling plan, inorganic parameters for this study were limited to fluoride, sulfate and TOC due to the limited sample volume available.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

STL Burlington noted that during the metals analysis, the interference check standards ICSA1 and ISCA2 yielded concentrations of zinc that were above the reporting limit. The laboratory suspects that the presence of zinc is attributable to contamination. No qualification was performed on the zinc results due to zinc concentrations being significantly less than the concentrations present in the ICS solution.

Additional issues addressed in the case narrative are summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The TOC vial for sample ZWERGLE-T02N-WCC arrived empty, but not broken, according to the sample receiving paperwork. However, the TOC vial was completely covered by the sample label and clear tape. As such, it is likely that the vial had a small crack that allowed the sample water to empty but still give the appearance that it wasn't broken. The TOC vial for sample LR-1-T02N-ASC was received broken. Therefore, the TOC analysis could not be performed on samples ZWERGLE-T02N-WCC and LR-1-T02N-ASC.
Holding Times	Yes	
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD/PDS • LD	N/A	Matrix QC analyses were not possible for the GSI Chamber Water sampling event due to the limited sampling volume available at each site.
Method QC • Surrogates • Serial Dilution ZWERGLE-D01N-ASC • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis conducted on sample ZWERGLE-D01N-ASC was applicable for 1 out of 24 analytes. The applicable analyte was within validation limits. The serial dilution results for the GSI Chamber Water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Cation/Anion balance calculations were not done because the analyte list did not include all of the necessary constituents.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	N/A	Field QC analyses were not possible for the GSI Chamber Water sampling event due to the limited sampling volume available at each site.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Boron (P) DF=1	---	-9.6	---	---	9.675	6.4	ZWERGLE-D01N-ASC ZWERGLE-D01N-WCC RR-5BB-D01N-ASC RR-5BB-D01N-WCC RR-15-D01N-ASC RR-15-D01N-WCC LR-1-D01N-ASC LR-1-D01N-WCC LR-8A-D01N-ASC LR-8A-D01N-WCC LR-16-D01N-ASC LR-16-D01N-WCC ZWERGLE-D02N-WCC ZWERGLE-D02N-ASC LR-1-D02N-WCC LR-1-D02N-ASC RR-5BB-D02N-ASC LR-8A-D02N-WCC LR-8A-D02N-ASC	UJ CCB-L or UJ MB,CCB-I or U MB-I
Molybdenum (MS) DF=1	0.3	---	---	---	---	0.20	ZWERGLE-D01N-ASC ZWERGLE-D01N-WCC RR-5BB-D01N-ASC RR-5BB-D01N-WCC	U CCB-I
Zinc (P) DF=1	---	---	---	---	3.229	1.9	ZWERGLE-D01N-ASC ZWERGLE-D02N-WCC	U MB-I

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit IDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT198S

Sampling Event: GSI Chamber Water

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 12/12/03

Peer Reviewer: Stacey Coker

Date Completed: 12/15/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics[3]
RR-15-T02N-WCC	SA	545917		W		X
RR-15-D02N-WCC	SA	545918		W	X	
RR-15-T02N-ASC	SA	545919		W		X
RR-15-D02N-ASC	SA	545920		W	X	
LR-16-T02N-WCC	SA	545921		W		X
LR-16-D02N-WCC	SA	545922		W	X	
LR-16-T02N-ASC	SA	545923		W		X
LR-16-D02N-ASC	SA	545924		W	X	
ZWERGLE-T03N-ASC	SA	545925		W		X
ZWERGLE-D03N-ASC	SA	545926		W	X	
ZWERGLE-T03N-WCC	SA	545927		W		X
ZWERGLE-D03N-WCC	SA	545928		W	X	
RR-5BB-T03N-ASC	SA	545929		W		X
RR-5BB-D03N-ASC	SA	545930		W	X	
RR-5BB-T03N-WCC	SA	545931		W		X
RR-5BB-D03N-WCC	SA	545932		W	X	
RR-15-T03N-ASC	SA	545933		W		X
RR-15-D03N-ASC	SA	545934		W	X	
RR-15-T03N-WCC	SA	545935		W		X
RR-15-D03N-WCC	SA	545936		W	X	
LR-1-T03N-ASC	SA	545937		W		X
LR-1-D03N-ASC	SA	545938		W	X	
LR-1-T03N-WCC	SA	545939		W		X
LR-1-D03N-WCC	SA	545940		W	X	
LR-8A-T03N-ASC	SA	545941		W		X
LR-8A-D03N-ASC	SA	545942		W	X	
LR-8A-T03N-WCC	SA	545943		W		X
LR-8A-D03N-WCC	SA	545944		W	X	
LR-16-T03N-ASC	SA	545945		W		X

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics[3]
LR-16-D03N-ASC	SA	545946		W	X	
LR-16-T03N-WCC	SA	545947		W		X
LR-16-D03N-WCC	SA	545948		W	X	

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

[3]In accordance with the sampling plan, inorganic parameters for this study were limited to fluoride, sulfate and TOC due to the limited sample volume available.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

Issues addressed in the case narrative are summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	N/A	Matrix QC analyses were not possible for the GSI Chamber Water sampling event due to the limited sampling volume available at each site.
Method QC • Surrogates • Serial Dilution RR-15-D02N-WCC • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis conducted on sample RR-15-D02N-WCC was applicable for 2 out of 24 analytes. The applicable analytes were within validation limits. The serial dilution results for the GSI Chamber Water sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Cation/Anion balance calculations were not done because the analyte list did not include all of the necessary constituents.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	N/A	Field QC analyses were not possible for the GSI Chamber Water sampling event due to the limited sampling volume available at each site.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=1	60.8	65.6	80.1	---	30.7	RR-15-D02N-WCC RR-15-D02N-ASC LR-16-D02N-WCC LR-16-D02N-ASC RR-5BB-D03N-ASC RR-5BB-D03N-WCC RR-15-D03N-ASC RR-15-D03N-WCC LR-1-D03N-ASC LR-1-D03N-WCC LR-8A-D03N-ASC LR-8A-D03N-WCC LR-16-D03N-ASC LR-16-D03N-WCC	U CCB-I
Iron (P) DF=1	34.2	---	37.3	---	30.0	RR-15-D02N-WCC ZWERGLE-D03N-ASC RR-5BB-D03N-ASC RR-5BB-D03N-WCC RR-15-D03N-WCC LR-8A-D03N-ASC	U CCB-I
Manganese (P) DF=1	---	---	---	1.610	1.0	ZWERGLE-D03N-ASC ZWERGLE-D03N-WCC	U MB-I
Zinc (P) DF=1	---	---	---	5.285	2.0	ZWERGLE-D03N-ASC ZWERGLE-D03N-WCC RR-5BB-D03N-ASC	U MB-I

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit IDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT199S

Sampling Event: GSI Chamber Water

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 12/12/03

Peer Reviewer: Stacey Coker

Date Completed: 12/15/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics[3]
ZWERGLE-T04N-ASC	SA	546141		W		X
ZWERGLE-D04N-ASC	SA	546142		W	X	
ZWERGLE-T04N-WCC	SA	546143		W		X
ZWERGLE-D04N-WCC	SA	546144		W	X	
RR-5BB-T04N-ASC	SA	546145		W		X
RR-5BB-D04N-ASC	SA	546146		W	X	
RR-5BB-T04N-WCC	SA	546147		W		X
RR-5BB-D04N-WCC	SA	546148		W	X	
RR-15-T04N-ASC	SA	546149		W		X
RR-15-D04N-ASC	SA	546150		W	X	
RR-15-T04N-WCC	SA	546151		W		X
RR-15-D04N-WCC	SA	546152		W	X	
LR-1-T04N-ASC	SA	546153		W		X
LR-1-D04N-ASC	SA	546154		W	X	
LR-1-T04N-WCC	SA	546155		W		X
LR-1-D04N-WCC	SA	546156		W	X	
LR-8A-T04N-ASC	SA	546157		W		X
LR-8A-D04N-ASC	SA	546158		W	X	
LR-8A-T04N-WCC	SA	546159		W		X
LR-8A-D04N-WCC	SA	546160		W	X	
LR-16-T04N-ASC	SA	546161		W		X
LR-16-D04N-ASC	SA	546162		W	X	
LR-16-T04N-WCC	SA	546163		W		X
LR-16-D04N-WCC	SA	546164		W	X	

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

[3]In accordance with the sampling plan, inorganic parameters for this study were limited to fluoride, sulfate and TOC due to the limited sample volume available.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

Issues addressed in the case narrative are summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	N/A	Matrix QC analyses were not possible for the GSI Chamber Water sampling event due to the limited sampling volume available at each site.
Method QC • Surrogates • Serial Dilution ZWERGLE-D04N-ASC • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis conducted on sample ZWERGLE-D04N-ASC was applicable for 1 out of 24 analytes. The applicable analyte was within validation limits. The serial dilution results for the GSI Chamber Water sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Table 1.2 summarizes the internal standard results outside evaluation criteria limits. Cation/Anion balance calculations were not done because the analyte list did not include all of the necessary constituents.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	N/A	Field QC analyses were not possible for the GSI Chamber Water sampling event due to the limited sampling volume available at each site.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=1	27.2	---	---	N/A	N/A	---	22.1	RR-5BB-D04N-ASC	U CCB-I
Antimony (MS) DF=1	0.7	0.6	0.7	1.6	1.4	---	0.50	ZWERGLE-D04N-ASC ZWERGLE-D04N-WCC RR-5BB-D04N-ASC RR-15-D04N-ASC RR-15-D04N-WCC LR-1-D04N-ASC LR-8A-D04N-WCC LR-16-D04N-WCC	U CCB-I
Chromium (P) DF=1	---	---	-2.1	N/A	N/A	-1.138	1.1	All samples in this package.	UJ MB-L or UJ MB,CCB-L
Molybdenum (MS) DF=1	0.3	---	0.2	0.3	---	---	0.20	ZWERGLE-D04N-ASC ZWERGLE-D04N-WCC RR-5BB-D04N-ASC RR-5BB-D04N-WCC	U CCB-I
Potassium (P) DF=1	424.9	---	---	N/A	N/A	318.200	318.0	ZWERGLE-D04N-ASC ZWERGLE-D04N-WCC RR-5BB-D04N-ASC RR-5BB-D04N-WCC RR-15-D04N-WCC LR-8A-D04N-ASC LR-8A-D04N-WCC	U MB,CCB-I or U MB-I
Zinc (P) DF=1	---	---	---	N/A	N/A	3.581	2.3	ZWERGLE-D04N-ASC ZWERGLE-D04N-WCC	U MB-I

P=ICP MS=ICP-MS CV= Cold Vapor MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit
RL= Reporting Limit IDL=RL for metals

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.2
Internal Standard Results
Not Meeting Acceptance Criteria and Data Qualification

Sample	%RI for Tb	Criteria	Analytes Affected	Qualification Codes
LR-16-D04N-WCC	120.2	30-120%	Sb, Cd	J/UJ IS-I

For the sake of brevity the table is limited to those internal standard results that indicated qualification.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: SOL094 Sampling Event: GSI Sediment

Matrix: Solid ☒ Water ☐ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Jennifer Winnike/Steve Baca Date Completed: 12/03/03

Peer Reviewer: Stacey Coker Date Completed: 12/09/03

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
ZWERGLE-T04N-SED	SA	546697		S	X	X
RR-5BB-T04N-SED[(1)]	SA	546698		S	X	X
RR-15-T04N-SED	SA	546699		S	X	X
RR-15-T04D-SED	FD	646700		S	X	X
LR-1-T04N-SED	SA	546701		S	X	X
LR-8A-T04N-SED	SA	546702		S	X	X
LR-16-T04N-SED	SA	546703		S	X	X
CONTROL-T04N-SED	SA	546704		S	X	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field blank FD = Field Duplicate

[1]Additional sample volume provided and used for matrix QC.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary:

The following issues, potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

The laboratory case narrative indicated the replicate analysis for sample RR-5BB-T04N-SED yielded a percent RPD for chloride that exceeded evaluation criteria. Since the sample and duplicate results were both less than 5X the reporting limit and the absolute difference between the two results was less than 2X the reporting limit, no qualifications of data were necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The original TOC analyses for the samples in this SDG were conducted within the holding time limit. Due to several QC outliers, these samples required reanalysis; all reanalyses were outside of the 28 day holding time. Qualification of results due to exceedance of holding time are summarized in Table 1.1
Method Blanks	No	Target analytes were detected in the method and continuing calibration blanks. The qualifications from these results are summarized in Tables 1.2.
Matrix QC • MS/MSD and LD RR-5BB-T04N-SED	No	The laboratory duplicate percent RPD was outside evaluation criteria for manganese. Qualifications based on these results are summarized in Table 1.3 Matrix spike results were outside evaluation criteria for Sb and Se. Qualifications based on these results are summarized in Table 1.4. As all GSI sediment samples were reported in one data package, the qualification noted in Table 1.4 was extended to the whole package.
Method QC • PDS RR-5BB-T04N-SED • Serial Dilution RR-5BB-T04N-SED • Internal Standards	Yes	
Field QC • Field Duplicate RR-15-T04N-SED/ RR-15-T04N-SED • Rinsate Blank • Field Blank • Trip Blank • Other (e.g., splits)	No	One analyte for the field duplicate analysis was outside the applicable concentration dependent criterion expressed in the QAPP. The results and actions are summarized in Tables 1.5.
Nondetect Results w/ Elevated RLs?	Yes	All of the nitrate as N results for the samples reported in this data package were reported as nondetect or qualified as nondetect at elevated reporting limits. No decision criteria was present in the QAPP for nitrate as N. Therefore, the elevated RLs not likely to affect project objectives.
Package Completeness	Yes	
Other parameters Evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	**Metals, ICS-** None of the samples contained interferent elements at concentrations equivalent to those in the ICS. As such, it was not necessary to evaluate positive and negative biases > IDL suggested by the ICSA samples.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Sediment Holding Time Qualification

Analysis	Samples Qualified	QAPP Requirement	Time Beyond Holding Time Limit	Qualification
TOC	ZWERGLE-T04N-SED RR-5BB-T04N-SED RR-15-T04N-SED RR-15-T04D-SED	28 days	18 days	J/UJ HT-I
	LR-1-T04N-SED LR-8A-T04N-SED LR-16-T04N-SED CONTROL-T04N-SED		2 days	

(1) All samples will be given an indeterminate (I) bias code for hold time qualification.

Table 1.2
Metals Blanks

Analyte	CCB 1 (µg/L)	CCB 2 (µg/L)	CCB 3 (µg/L)	CCB 4 (µg/L)	CCB 5 (µg/L)	CCB 6 (µg/L)	MB (mg/Kg)	IDL (µg/L)	Samples Qualified	Qualification
Boron (P)							1.509	6.4	CONTROL-T04N-SED LR-1-T04N-SED ZWERGLE-T04N-SED	U MB-I
Copper (P)							1.932	2.0	CONTROL-T04N-SED	U MB-I
Zinc (P)							0.998	2.0	CONTROL-T04N-SED	U MB-I

CCB – Continuing Calibration Blank **MB** – Method Preparation Blank **IDL** – Instrument Detection Limit for Metals P-Emission

Note: Table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.3
Laboratory Duplicate Results for Sample RR-5BB-T04N-SED

Analysis	RPD (%)	Comment	Action
Manganese	50.3	RPD exceeded evaluation criteria	Parent sample result qualified J D-I

Acceptance limits: RPD ≤35% when both results are > 5x RL; otherwise, Absolute Difference ≤ 2x RL.

RPD = Relative Percent Difference RL = Reporting Limit.

CRDL = CLP Contract Required Detection Limit IDL = Instrument Detection Limit

For the purpose of concentration dependent evaluation criteria, the CRDL was used as the RL as the IDLs are too low for the evaluation to be meaningful.

Table 1.4
Matrix Spike Recovery Results for Sample RR-5BB-T04N-SED

Analyte	% Recovery	PDS % Recovery	Results Qualified	Qualification and Qualification Codes
Antimony	34.1	112.5	Nondetect result for parent sample	Qualify all sample results as estimated (UJ MS-L) [1]
Selenium	44.4	100.2	Positive result for parent sample	

[1] Data qualification was extended to the whole GSI sediment data set, primarily based on the fact that these two analytes tended to have low recoveries in all other sediment sampling events.

Table 1.5
Field Duplicate Results Qualified for
Samples RR-15-T04N-SED and RR-15-T04D-SED

Analyte	FD Results		RPD %	Qualification
	RR-15-T04N-SED (mg/Kg)	RR-15-T04D-SED (mg/Kg)		
Molybdenum	9	4.9	59	J FD-I

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE FALL 2002 HEXAVALENT CHROMIUM ANALYSES

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004

URS

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8181 E. Tufts Avenue
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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Hexavalent Chromium Analysis 2-1

2.1 Onsite Laboratory 2-1
2.1.1 Audit of the Onsite Laboratory 2-1
2.1.2 Method Detection Limit Study and Demonstration of Capability Study 2-1
2.1.3 Qualification of Results 2-2
2.2 Fixed Laboratory-STLD 2-2
2.2.1 STLD Hexavalent Chromium Procedure 2-2
2.2.2 Qualification of Results 2-2

Section 3 Data Review Process 3-1

Section 4 Data Review Commentary 4-1

4.1 Data Review Narratives 4-1
4.2 General Data Quality Issues 4-1
4.2.1 Laboratory Performance Review (LPR) Findings 4-1

Section 5 Collective Summary/Assessment of Matrix QC Results 5-1

5.1 Matrix Spike Results (Accuracy Evaluation) 5-2
5.1.1 Groundwater Matrix Spike 5-2
5.1.2 Surface Water Matrix Spike 5-3
5.2 Laboratory Duplicates (Precision Evaluation) 5-3
5.2.1 Groundwater Laboratory Duplicate 5-3
5.2.2 Surface Water Laboratory Duplicate 5-4
5.3 Matrix Effects Noted By the Analyst 5-4

Section 6 Collective Summary/Assessment of Filed QC Results 6-1

6.1 Field Duplicate Samples 6-1
6.1.1 Groundwater Field Duplicate Results 6-2
6.1.2 Surface Water Field Duplicates Results 6-2
6.2 Rinsate Blank Results 6-2
6.2.1 Groundwater Rinsate Blanks 6-3
6.2.2 Surface Water Rinsate Blanks 6-3
6.3 Field Blank Results 6-3

Section 7 Overall Data Quality Indicator Assessment 7-1

7.1 Precision 7-1
7.2 Accuracy 7-1

7.3 Completeness 7-1
7.4 Representativeness 7-1
7.5 Comparability 7-2
7.6 Sensitivity 7-2

List of Tables

Table 1-1 Summary of Groundwater Samples Collected During Hexavalent Chromium Sampling Event

Table 1-2 Summary of Surface Water Samples Collected During Hexavalent Chromium Sampling Event

Table 5-1 Field Samples Submitted for MS/MSD/LD

Table 5-2 Count of MS/MSD analyses for the Hexavalent Chromium Sampling Event

Table 5-3 Matrix Spike/Matrix Spike Duplicate Results for Groundwater Samples

Table 6-1 Field Duplicate Collected During the Hexavalent Chromium Sampling Event

Table 6-2 Field Duplicate Collection Frequency for the Hexavalent Chromium Sampling Event

Table 6-3 Rinsate Blanks Collected During the Hexavalent Chromium Sampling Event

Table 6-4 Rinsate Blank Collection Frequency for the Hexavalent Chromium Sampling Event

List of Attachments

Attachment 1.1 Data Package HEX01

Attachment 1.2 Data Package HEX02

Attachment 1.3 Data Package HEX03

Attachment 1.4 Data Package HEX04

Attachment 1.5 Data Package HEX05

Attachment 1.6 Data Package HEX06

Attachment 1.7 Data Package HEX07

Attachment 1.8 Data Package HEX08

Attachment 1.9 Data Package HEX09

Attachment 1.10 Data Package HEX10

Attachment 1.11 Data Package HEX11

Attachment 1.12 Data Package HEX12

Attachment 1.13 Data Package D2J080118

Attachment 1.14 Data Package D2J090175

TABLE OF CONTENTS

Attachment 1.15 Data Package D2J100114

Attachment 1.16 Data Package D2K050113

Attachment 1.17 Data Package D2K080117

Attachment 1.18 Data Package D2K140139

This Data Validation Report (DVR) provides a general overview of the usability of chemical data obtained from the onsite and fixed site hexavalent chromium sampling activities at Molycorp. In addition, this data validation report is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

This report contains the results of the data validation conducted for groundwater and surface water samples collected to analyze hexavalent chromium at the Molycorp Questa Mine, Questa, New Mexico. These water samples were collected in support of the Remedial Investigation/ Feasibility Study (RI/FS). Several of the water samples were collected and analyzed onsite, while others were sent to Severn Trent Laboratories Denver (STLD) in Arvada, CO. The number of samples collected and analyses conducted were consistent with the RI/FS Field Sampling Plan. The analytical methods used and quality control samples collected were in accordance with the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). The results were reported in twelve onsite and six fixed site original data packages.

The groundwater and surface water samples collected during the hexavalent chromium sampling event are summarized in Tables 1.1 and 1.2, respectively. Included in these tables is the number of QC samples collected for each matrix.

Table 1-1
Summary of Groundwater Samples Collected During Hexavalent Chromium Sampling Event

Sample Identification (SDG)	Hexavalent Chromium
MW-A-T01N-GRW (HEX04)	X
MW-B-T01N-GRW (HEX04)	X, MS/MSD
MW-14-T01N-GRW (HEX05)	X, MS/MSD
MW-10-T01N-GRW (HEX06)	X, MS/MSD
MW-7C-T01N-GRW (HEX07)	X
MW-4-T01N-GRW (HEX07)	X, MS/MSD
MW-7A-T01N-GRW (HEX07)	X, RB
MW-9A-T01N-GRW (HEX07)	X
MW-7A-T01N-GRW (HEX07)	X, MS/MSD
MW-11-T01N-GRW (HEX08)	X
MW-12-T01N-GRW (HEX08)	X, MS/MSD
MW-13-T01N-GRW (HEX08)	X
MW-15-T01N-GRW (HEX08)	X
MW-1-T01N-GRW (HEX09)	X
MMW-25B-T01N-GRW (HEX09)	X
MMW-29A-T01N-GRW (HEX09)	X, MS/MSD
MMW-29B-T01N-GRW (HEX09)	X
MMW-24-T01N-GRW (HEX09)	X
COLUMBINE CAMP GROUND-T01N-GRW (HEX09)	X
MMW-35B-T01N-GRW (HEX09)	X
MMW-36B-T01N-GRW (HEX10)	X, MS/MSD
MMW-17B-T01N-GRW (HEX10)	X, MS/MSD
MMW-23A-T01N-GRW (HEX10)	X
MMW-23B-T01N-GRW (HEX10)	X
MMW-34B-T01N-GRW (HEX10)	X

Table 1-1
Summary of Groundwater Samples Collected During Hexavalent Chromium Sampling Event

Sample Identification (SDG)	Hexavalent Chromium
MMW-36B-T01N-GRW (HEX10)	X
MMW-30A-T01N-GRW (HEX11)	X
MMW-30B-T01N-GRW (HEX11)	X, MS/MSD
MMW-31A-T01N-GRW (HEX11)	X, FD, MS/MSD
MMW-8B-T01N-GRW (HEX12)	X, FD
MMW-13-T01N-GRW (HEX12)	X
MMW-32A-T01N-GRW (HEX12)	X, MS/MSD
MMW-19A-T01N-GRW (HEX12)	X, FD
MMW-8A-T01N-GRW (HEX12)	X, FD, MS/MSD, RB
CAPULIN1-T01N-GRW (D2J090175)	X
SPRING39-T01N-GRW (D2J090175)	X
SPRING10-T01N-GRW (D2J090175)	X
SPRING9-T01N-GRW (D2J090175)	X
LOWERSPRING13-T01N-GRW (D2J100114)	X
P-3-T01N-GRW (D2K050113)	X
MMW-43A-T01N-GRW (D2K050113)	X
MMW-11-T01N-GRW (D2K050113)	X, MS/MSD/LD
MMW-11A-T01N-GRW (D2K050113)	X, FD
MMW-10A-T01N-GRW (D2K050113)	X
MMW-10B-T01N-GRW (D2K050113)	X
MMW-10C-T01N-GRW (D2K050113)	X
MMW-18B-T01N-GRW (D2K050113)	X, RB
MMW-17A-T01N-GRW (D2K050113)	X, MS/MSD
EW-1-T01N-GRW (D2K080117)	X, MS/MSD/LD
EW-2-T01N-GRW (D2K080117)	X
EW-3-T01N-GRW (D2K080117)	X
EW-4-T01N-GRW (D2K070118)	X
EW-5A-T01N-GRW (D2K080117)	X
EW-5B-T01N-GRW (D2K080117)	X
MW-17-T01N-GRW (D2K080117)	X
OUTFALL002-T01N-GRW (D2K080117)	X
EW-5D-T01N-GRW (D2K080117)	X
EW-6-T01N-GRW (D2K080117)	X
MMW-31B-T01N-GRW (D2K080117)	X
US-1-T01N-GRW (D2K080117)	X, RB
US-2-T01N-GRW (D2K080117)	X
US-3-T01N-GRW (D2K080117)	X
SPRING14-T01N-GRW (D2K080117)	X
CLOUMBINE2-T01N-GRW (D2K080117)	X
MMW-44A-T01N-GRW (D2K140139)	X, MS/MSD/LD
Number GW samples	65
Number MS/MSD or MS/LD	17
Number Field Duplicates	5
Number Rinsate Blanks	4
Number Field Blanks	NA

MS/MSD = Matrix Spike/Matrix Spike Duplicate MS/LD =Matrix Spike/Laboratory Duplicate
RB = Rinsate Blank FD = Field Duplicate GRW = Groundwater NA = Not Applicable

Table 1-2
Summary of Surface Water Samples Collected During Hexavalent Chromium Sampling Event

Sample Identification (SDG)	Hexavalent Chromium
LR-13-T01N-SFW (HEX 01)	X
LR-16-T01N-SFW (HEX01)	X, MS/LD
LR-8A-T01N-SFW (HEX01)	X, FD
LR-11A-T01N-SFW (HEX01)	X
LR-4-T01N-SFW (HEX02)	X
RR-18B-T01N-SFW (HEX02)	X, MS/MSD
RR-20-T01N-SFW (HEX02)	X
LR5-T01N-SFW (HEX02)	X
RR1-T01N-SFW (HEX02)	X
RR-18A-T01N-SFW (HEX03)	X
RR-13-T01N-SFW (HEX03)	X, MS/MSD
RR-13-T01N-SFW 16:35 (HEX03)	X
RR-14-T01N-SFW (HEX03)	X
RR-15-T01N-SFW (HEX03)	X
RR-16-T01N-SFW (HEX03)	X
RR-17-T01N-SFW (HEX03)	X
ERLOUT-T01N-SFW (D2J080118)	X, FD
RRS-9-T01N-SFW (D2J080118)	X, MS/MSD/LD
RRS-12-T01N-SFW (D2J080118)	X
ZWERGEL-T01N-SFW (D2J080118)	X
SW12-4-T01N-SFW (D2J080118)	X
SW12-9-T01N-SFW (D2J080118)	X
SW12-6-T01N-SFW (D2J080118)	X
SW12-7-T01N-SFW (D2J080118)	X
SW12-5-T01N-SFW (D2J080118)	X
SW12-10-T01N-SFW (D2J080118)	X
ERLIN-T01N-SFW (D2J080118)	X, MS/MSD/LD
ERLMID-T01N-SFW (D2J080118)	X
ERLOUT-T01N-SFW (D2J080118)	X
GOATHILL SPRING-T01N-SFW (D2J090175)	X
UFLMID-T01N-SFW (D2J090175)	X
UFLIN-T01N-SFW (D2J090175)	X
UFLOUT-T01N-SFW (D2J090175)	X
SW12-2-T01N-SFW (D2J090175)	X
SW12-3-T01N-SFW (D2J090175)	X
SW12-1-T01N-SFW (D2J090175)	X, MS/MSD/LD
ND-1-T01N-SFW (D2J100114)	X, RB
CD-T01N-SFW (D2J100114)	X
Number SFW samples	38
Number MS/MSD or MS/LD	6
Number Field Duplicates	2
Number Rinsate Blanks	1
Number Field Blanks	NA

MS/MSD = Matrix Spike/Matrix Spike Duplicate SFW= Surface water
MS/LD = Matrix Spike/Laboratory Duplicate RB = Rinsate Blank FD = Field Duplicate NA = Not Applicable

The QAPP required that the quality control samples listed above be collected at a frequency of 5%. As illustrated by the tables above, the required frequency of QC analyses was satisfied for each analysis type, with the exception of the surface water rinsate blanks, which were had a frequency of 3%. The surface water rinsate blanks will be discussed in detail in Section 5.0.

The hexavalent chromium analysis was accomplished with a mixture of onsite analyses and fixed laboratory analyses. The onsite laboratory was staffed with an analyst from STLD. The fixed laboratory analyses were conducted at STLD. In order to meet holding times, the samples were couriered to STLD on a daily basis when onsite laboratory personnel were not available.

2.1 ONSITE LABORATORY

The analysis of the hexavalent chromium for groundwater and surface water samples has a 24-hour holding time limit. In order to meet the holding time requirement, some of the analyses were conducted onsite by an STLD representative.

2.1.1 Audit of the Onsite Laboratory

The audit of the onsite analysis of hexavalent chromium showed that the samples were routinely filtered prior to analysis to avoid interference of suspended particulate with the colorimetric analysis. The filtering of samples was not in the STLD SOP, however, it was determined that the filtering was necessary to avoid particulate interference. Therefore, the analysts were asked to record all deviations from the procedure in the STLD SOP into a logbook kept onsite. It was also recommended that the onsite laboratory analysts filter the method blanks since they were also carried through the entire analytical procedure. No other practices were observed during auditing of hexavalent chromium analysis that were considered to adversely affect the quality of the analytical data.

2.1.2 Method Detection Limit Study and Demonstration of Capability Study

The onsite laboratory conducted two method detection limit (MDL) studies and a demonstration of capability study to validate the precision and accuracy of the onsite sample results.

The first MDL study was performed on the HACH DR/2010 instrument on 10/27/02. The calculated MDL was 0.0021 mg/L. Seven replicate spike measurements were taken with a spike concentration of 0.01 mg\L, which meets the MDL (40 CFR 136, Appendix B) required spike level since it is not more than ten times the calculated MDL and also not less than the calculated MDL. Furthermore, the spike recovery ranged from 78-99, indicating acceptable accuracy at the reporting limit of 0.01 mg/L.

The second MDL study was performed on the Spec 301 instrument also on 10/27/02. However, none of the samples were analyzed on this equipment; therefore this study was not used to verify the MDL.

The demonstration of capability study validated the analyst aptitude at performing the analyses. In this study, the analyst analyzed four replicate LCS spikes, which had an average percent recovery of 100.2% and a RSD of 1.6%. This demonstrated the analyst accuracy at analyzing a parallel series of LCS spikes with results that were almost 100% percent accurate. Furthermore, this demonstrated acceptable precision by achieving a RSD across the four results of less than 13%.

2.1.3 Qualification of Results

There were twelve SDGs analyzed onsite for hexavalent chromium, which included thirty-four groundwater and sixteen surface water samples. All of the sixteen surface water results were nondetect, and twenty-one of the groundwaters results were nondetect. Of the thirteen groundwater samples results that were detects, only one were greater than the Human Health RBSL of 0.011 mg/L for a hazard quotient equal to 0.1. Hexavalent chromium was detected in the sample results for MMW-24-T01N-GRW (0.0205 mg/l). The sample results were less than the dissolved total chromium results (0.16 mg/l) from the collection date 11/1/02 indicating agreement between the two methods.

Two samples and one field duplicate were qualified based on the method blank. Also, eleven of the groundwater sample results were qualified as estimated because the sample concentrations were reported between the method detection limit and the sample quantitation limit. Three of these sample qualifications overlapped with the method blank qualification. A more detailed description is provided in the individual review summaries of in attachment 1.

2.2 FIXED LABORATORY-STLD

An analyst was unavailable to work onsite from 10/5/2002 to approximately 11/14/2002. During this time frame, a courier was provided by STLD to shuttle hexavalent chromium samples from the Molycorp facility to the STLD laboratory.

2.2.1 STLD Hexavalent Chromium Procedure

The hexavalent chromium analysis procedure at the STLD facility differs from the onsite laboratory because the onsite laboratory procedure had to perform a filtering process prior to analysis to avoid interference of suspended particulate with the colorimetric analysis, whereas the offsite laboratory did not filter the sample.

2.2.2 Qualification of Results

There were six SDGs analyzed offsite for hexavalent chromium, which included thirty groundwater and twenty-two surface water samples. Of the thirty groundwater results, one was detected and greater than the Human Health RBSL of 0.011 mg/l for a hazard quotient equal to 0.1 and one was rejected due to a low matrix spike recovery that was below 30%. Also, of the eleven surface water samples results that were detects, only one was greater than the Human Health RBSL of 0.011 mg/L from a hazard quotient equal to 0.1.

Hexavalent chromium was detected in the sample results for LOWER SPRING13-T01N-GRW (0.022 mg/l) and CAPULIN 1-T01N-SFW (0.016 mg/l). Both sample results were less than the dissolved total chromium results (0.16 mg/l) from the collection date 10/8/02 and 10/9/02, respectively indicating agreement.

One fixed-site matrix spike recovery (run on MMW-44A-T01N-GRW), was below the MS and MSD acceptance limits, and was less the 30%. Therefore, the parent sample result was rejected. Seven surface water sample results out of twenty-two marginally exceeded the holding time and were qualified as estimated. Also, nine surface water sample results were qualified as estimated because the sample concentrations were reported between the method detection limit and the

sample quantitation limit. Six of these sample qualifications overlapped with the holding time qualification. A more detailed description is provided in the individual review summaries of in Attachment 1.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include, if documented in the SDG: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, matrix spike recoveries, laboratory duplicate analyses, and results for field quality control samples (e.g., field duplicates, rinsate blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include, if documented in the SDG: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Section 3.0 includes the data review narratives for each of the data packages. In all cases of professional judgment exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative.

After completing the review sample-specific and laboratory performance parameters in accordance with SOP 12.1, the site-specific matrix spike results, laboratory duplicate results, rinsate blanks, and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. The reason for this is that site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Where applicable, the

potential direction of bias (high, low, or indeterminate) has been identified and noted on the sample results sheets as H, L, or I, respectively. Section 5.0 presents the collective summary of the field QC results (rinsate blanks and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 6.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

4.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for the data packages included in this event. In order to attain the frequency requirements for onsite and STLD laboratory performance reviews, two data packages (HEX01 and D2J080118) were evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

4.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identify whether findings globally affect all relevant water samples analyzed for the hexavalent chromium groundwater and surface water sampling event. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

4.2.1 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL data package D2J080118 was used to evaluate laboratory performance criteria. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated were found to be acceptable and no additional packages for this event were required to be assessed for laboratory performance parameters.

The site-specific matrix spike (MS)/ matrix spike duplicate (MSD) results and laboratory duplicate (LD) results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following two subsections present a discussion on the MS/MSD analysis and LD analysis results with the samples collected for the hexavalent chromium sampling event.

Additional aliquots of seventeen groundwater samples and seven surface water samples, including one rinsate blank, were submitted for use in matrix QC analyses. Also, three groundwater samples and five surface water samples, including one rinsate blank, were submitted for laboratory duplicates analyses. Table 5-1 below summarizes the site-samples that were used to prepare MS, MSD, and LD samples.

Table 5-1
Field Samples Submitted for MS/MSD/LD

Sample ID	Matrix		Data Package
MW-B-T01N-GRW	Groundwater	MS/MSD	HEX04
MW-14-T01N-GRW	Groundwater	MS/MSD	HEX05
MW-10-T01N-GRW	Groundwater	MS/MSD	HEX06
MW-7A-T01N-GRW	Groundwater	MS/MSD	HEX07
MW-12-T01N-GRW	Groundwater	MS/MSD	HEX08
MMW-29A-T01N-GRW	Groundwater	MS/MSD	HEX09
MMW-17B-T01N-GRW	Groundwater	MS/MSD	HEX10
MMW-31A-T01N-GRW	Groundwater	MS/MSD	HEX11
MMW-32A-T01N-GRW	Groundwater	MS/MSD	HEX12
MMW-8A-T01N-GRW	Groundwater	MS/MSD	HEX12
MMW-11-T01N-GRW	Groundwater	MS/MSD/LD	D2K050113
MMW-17A-T01N-GRW	Groundwater	MS/MSD	D2K050113
EW-1-T01N-GRW	Groundwater	MS/MSD/LD	D2K080117
MMW-44A-T01N-GRW	Groundwater	MS/MSD/LD	D2K140139
LR-16-T01N-SFW	Surface Water	MS/LD	HEX01
RR-18B-T01N-SFW	Surface Water	MS/MSD	HEX02
RR-13-T01N-SFW	Surface Water	MS/MSD	HEX03
RRS-9-T01N-SFW	Surface Water	MS/MSD/LD	D2J080118
ERLIN-T01N-SFW	Surface Water	MS/MSD/LD	D2J080118
SW12-1-T01N-SFW	Surface Water	MS/MSD/LD	D2J090175
RB-01T-SFW	Rinsate Blank	MS/MSD/LD	D2J100114

Table 5-2 lists the groundwater and surface water MS/MSD sample sets relative to the number of field samples.

Table 5-2
Count of MS/MSD analyses for the Hexavalent Chromium Sampling Event

Analyses	Number of MS/MSD Samples	Total Samples	Percentage (%)
Groundwater			
Hexavalent chromium-Onsite	10	34	29
Hexavalent chromium-STLD	4	31	13
GRW Total	14	65	22
Surface Water			
Hexavalent chromium-onsite	3	16	19
Hexavalent chromium-STLD	3*	22	14
SFW Total	6	38	16

* = There were four MS/MSD surface water samples, however, one of the MS/MSD samples was analyzed on a rinsate blank which is an inappropriate measure for a matrix spike recovery. Therefore, this sample was not included in the overall MS/MSD assessment for hexavalent chromium.

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

5.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results. Two spike recoveries were outside of the QC acceptance limits of 75-125% for hexavalent chromium. A collective assessment for the MS/MSD was performed for each of the sampling events. During this evaluation, if less than a quarter of the valid spike recoveries were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

5.1.1 Groundwater Matrix Spike

Although the majority of the groundwater matrix spike recoveries were within acceptance limits, there were two spike recoveries that were below the acceptance limit of 75-125%. Table 5-3 summarizes the MS/MSD results, including the spike percent recovery that is outside of acceptance limits, the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added), and the qualification action required based on the collective review.

Table 5-3
Matrix Spike/Matrix Spike Duplicate Results for Groundwater Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	%R outside of Acceptance Limit	Average %R	Action
Onsite-MS						
Hexavalent chromium	10	0	0	---	96.2	
Onsite-MSD						
Hexavalent chromium	10	0	0	---	97.7	
STLD -MS						
Hexavalent chromium	3	**1**	0	23.0	105.0	R MS-L, reject parent (MMW-44A-T01N-GRW) result only
STLD -MSD						
Hexavalent chromium	3	**1**	0	25.0	107.0	R MS-L, reject parent (MMW-44A-T01N-GRW) result only

The vast majority (>92%) of the groundwater matrix spike results were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

5.1.2 Surface Water Matrix Spike

Seven surface water samples (3 onsite, 4 STLD including a rinsate blank sample) were used for the MS/MSD analysis. The rinsate blank that was used to analyze the MS/MSD was an inappropriate measurement of a matrix spike recovery. Therefore, this sample was not included in the overall MS/MSD assessment for hexavalent chromium. The other three surface water matrix spike recoveries were within acceptance limits. Therefore, no qualifications of data were necessary.

5.2 LABORATORY DUPLICATES (PRECISION EVALUATION)

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The Relative Percent Difference (RPD) criterion of ≤20% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL.

5.2.1 Groundwater Laboratory Duplicate

Three laboratory duplicates analyses were performed for the groundwater samples. All of the results were nondetect and met the laboratory criteria; therefore no qualification was necessary

5.2.2 Surface Water Laboratory Duplicate

Five laboratory duplicate analyses were performed on the surface water samples. One of these LD samples was a rinsate blank, which was an inappropriate measurement of a laboratory duplicate precision. Therefore, this sample was not included in the overall LD assessment for hexavalent chromium. Of the other four LD samples, two were nondetect, and therefore had no results qualified. The other two LD samples had slight detects, but the absolute difference was less than one times the reporting limit. Since these two samples met the LD criteria, they were also not qualified.

5.3 MATRIX EFFECTS NOTED BY THE ANALYST

There were two samples, MMW-30B-T01N-GRW and MMW-36B-T01N-GRW, which exhibited different matrix effects during analysis at the onsite laboratory.

Sample MMW-30B-T01N-GRW analyzed on 11/3/02 produced a false positive. When the diphehylcarbizine was added, the sample formed a white precipitate, which increased the amount of absorption in the sample. Also, the sample did not turn a pink color and small bubbles formed at the bottom of the cap, indicating that the sample was deviating from a typical reaction. The sample was diluted to a 10x dilution and re-analyzed. Also, a matrix spike was analyzed with the 10x dilution. With the 10x dilution, none of the previous precipitate formed but the absorption was still indicated a detection. Also, the MS did not have a recovery. The sample was then diluted to a 100x dilution and re-analyzed with an associated MS. The sample result exhibited the same absorbence as the 10x dilution; however, the sample had a much larger concentration than the 10x dilution. Also, the MS at the 100x dilution had a recovery of -470.0%. The sample was diluted a third time to a 200x dilution and re-analyzed with an associated MS. There was no detection in the 200x dilution sample result and the MS recovery was 95.4%. The original, 10x, and 100x hexavalent chromium results were rejected as R MS-L to reflect the false positive result and the 200x dilution was selected as preferred result.

Sample MMW-36B-T01N-GRW analyzed on 11/1/02 produced a small hit (0.0033 mg/L) above the MDL but below the RL. The sample didn't produce the right color during analysis. Therefore, the sample was re-analyzed with a matrix spike. The sample came out with a higher value (0.053 mg/L) than the original sample; however, the MS did not have a recovery. The sample was then diluted (10x), spiked, and reanalyzed, to evaluate whether there was a matrix effect. The matrix spike recovery at the 10x dilution was less than the previous MS recovery. The sample was then diluted to a 100x dilution, spiked, and reanalyzed. This second MS recovery was 30.4%. Thus, the analyst concluded that an even larger dilution would have produced a larger MS recovery. Therefore, this sample was rejected R MS-L due to the matrix effect on hexavalent chromium analysis.

The site-specific rinsate blanks and field duplicate results were assessed collectively by matrix to determine the need for qualification of sample results of similar matrix. Field duplicate agreement was assessed to determine the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. The following sections present a discussion on the field duplicate results and rinsate blank results associated with the samples collected during the sampling event.

6.1 FIELD DUPLICATE SAMPLES

Seven field duplicate sample pairs were collected during this sampling event. The field duplicate pairs and frequencies are listed in the Table 6-1 and 6-2 below. The number of field duplicates among the sixty-five groundwater samples satisfied the QAPP requirement of 5%. Also, the number of the field duplicates among the thirty-eight surface water samples satisfied the QAPP requirement of 5%.

Table 6-1
Field Duplicate Collected During the Hexavalent Chromium Sampling Event

Sample ID	Matrix	Data Package
MMW-31A-T01N-GRW/ MMW-31A-T01D-GRW	Groundwater	HEX11
MMW-8B-T01N-GRW/ MMW-8B-T01D-GRW	Groundwater	HEX12
MMW-19A-T01N-GRW/MMW-19A-T01D-GRW	Groundwater	HEX12
MMW-8A-T01N-GRW/MMW-8A-T01D-GRW	Groundwater	HEX12
MMW-11A-T01N-GRW/MMW-11A-T01D-GRW	Groundwater	D2K050113
LR-8A-T01N-SFW/LR-8A-T01D-SFW	Surface Water	HEX01
ERLOUT-T01N-T01D-SFW	Surface Water	D2J080118

Table 6-2
Field Duplicate Collection Frequency for the Hexavalent Chromium Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
GROUNDWATER			
Hexavalent Chromium-onsite	4	34	12
Hexavalent Chromium-STLD	1	31	3
GRW Total	5	65	8
SURFACE WATER			
Hexavalent Chromium-onsite	1	16	6
Hexavalent Chromium-STLD	1	22	5
SFW Total	2	38	5

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion of ≤30% was applied for cases in which both the sample and sample duplicate concentration were greater than two times the reporting limit. For field duplicate pairs where the sample or duplicate concentration was less than five times the reporting limits, the absolute difference between the sample and duplicate was compared to the criterion of two times the greater RL.

6.1.1 Groundwater Field Duplicate Results

All field duplicate results were within evaluation criteria for groundwater samples, therefore, no qualifications of data were necessary.

6.1.2 Surface Water Field Duplicates Results

All field duplicate results were within evaluation criteria for surface water samples, therefore, no qualifications of data were necessary.

6.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blanks are prepared by running distilled water over the sample equipment in an identical manner to the field samples with which they are associated. Tables 6-3 and 6-4 summarize the rinsate blank samples associated with the samples collected during the hexavalent chromium groundwater and surface water sampling event.

Table 6-3
Rinsate Blanks Collected During the Hexavalent Chromium Sampling Event

Sample ID[1]	Matrix	Data Package
RB01T-GRW	Groundwater	HEX07
RB02T-GRW	Groundwater	HEX12
RB03T-GRW	Groundwater	D2K050113
RB07T-GRW	Groundwater	D2K080117
RB-01T-SFW	Surface water	D2J100114

[1] The "T" in the field ID was changed to "D" for dissolved metals samples.

Table 6-4
Rinsate Blank Collection Frequency for the Hexavalent Chromium Sampling Event

Analyses	Number of RB Samples	Total Samples	Percentage (%)
Groundwater			
Hexavalent Chromium-onsite	2	34	6
Hexavalent Chromium-STLD	2	31	6
GRW Total	4	65	6
Surface Water			
Hexavalent Chromium-onsite	0	16	0
Hexavalent Chromium-STLD	1	22	4
SFW Total	1	38	3
Aqueous Total	5	103	5

As there were 103 total aqueous samples and 5 rinsate blanks analyzed, the frequency of aqueous rinsate blank collection satisfied the QAPP requirement of 5%.

6.2.1 Groundwater Rinsate Blanks

All of the rinsate blank results were nondetect, therefore none of the groundwater results were qualified based on the rinsate blank.

6.2.2 Surface Water Rinsate Blanks

The rinsate blank results was nondetect, therefore none of the surface water results were qualified based on the rinsate blank.

6.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field Blanks are generated by pouring laboratory-supplied reagent grade water into certified pre-cleaned sample containers, at the sample collection site. In accordance with the project QAPP, field blanks were only required for organic parameters, therefore, no field blanks were associated with the hexavalent chromium sampling event.

One fixed laboratory nondetect sample result, MMW-44A-T01N-GRW, was rejected based on the matrix spike recovery that was less than 30%. Also, two onsite laboratory sample results were rejected due to matrix effects. All other data was considered acceptable for use in meeting project objectives as qualified. One sample result was qualified as estimated based on the low matrix spike recovery, as described in Section 4.1. Furthermore, seven sample results were qualified as estimated based on the holding time and twenty-three results qualified as estimated for the concentration of the sample result being reported between the method detection limit and the sample quantitation limit. These findings are also discussed in greater detail in the individual data review summary (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

7.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a RPD or as an absolute difference between field duplicate or laboratory duplicate results. One hundred percent of field duplicate and laboratory duplicate results satisfied the applicable evaluation criteria for each analysis type.

7.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Ninety-two percent of groundwater MS/MSD recoveries and one hundred percent of the surface water MS/MSD recoveries met acceptance.

7.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results, except three sample results that were rejected, were considered usable as qualified for meeting project objectives. As such, a percentage of 97% was calculated to represent the completeness of aqueous hexavalent chromium analyses, which satisfied the QAPP completeness goal of 80%.

7.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the groundwater and surface water samples. The close agreement between the field duplicate results, as discussed in Section 5.1, indicated that the samples collected were adequately representative of the medium sampled.

7.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

7.6 SENSITIVITY

The onsite and fixed laboratories reported the nondetect hexavalent chromium results relative to an RL of 0.01 mg/L. These RLs are slightly above the QAPP required 0.005 mg/L but still below all SLCs. The MDL of 0.021 mg/L and 0.0014 mg/L for the onsite and fixed laboratory analyses both met the QAPP criteria of being at least three times lower than the RL. There was one diluted non-detectable result for the hexavalent chromium event. MMW-30B-T01N-GRW was reported as nondetectable from a 200x dilution and had an elevated RL of 2 mg/L. None of the other RLs were elevated and are considered useable for comparison to SLCs.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: HEX01 Sampling Event: Fall 2002

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/15/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses
					Hexachrom.
LR-13-T01N-SFW	SA	HEX01-001		W	X
LR-16-T01N-SFW	SA	HEX01-002		W	X
LR-8A-T01N-SFW	SA	HEX01-003		W	X
LR-8A-T01D-SFW	FD	HEX01-004		W	X
LR-11A-T01N-SFW	SA	HEX01-005		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	Yes	
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS LR-16-T01N-SFW • LD LR-16-T01N-SFW	Yes	Matrix spike (MS) and laboratory duplicate (LD) analysis was conducted on sample LR-16-T01N-SFW. All the MS and LD results were within acceptance limits. The MS and LD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate (FD) LR-8a-T01N-SFW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package included a field duplicate (FD) sample that was within the control criteria. The field quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: HEX02 Sampling Event: Fall 2002

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/15/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses
					Hexachrom.
LR-4-T01N-SFW	SA	HEX02-001		W	X
RR-18B-T01N-SFW	SA	HEX02-002		W	X
RR-20-T01N-SFW	SA	HEX02-003		W	X
LR5-T01N-SFW	SA	HEX02-004		W	X
RR1-T01N-SFW	SA	HEX02-005		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	Yes	
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS RR-18B-T01N-SFW • LD	Yes	Matrix spike (MS) and matrix spike duplicate (MSD) analysis was conducted on sample RR-18B-T01N-SFW. All the MS and MSD results were within acceptance limits. The MS and MSD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: HEX03 Sampling Event: Fall 2002

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/15/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses
					Hexachrom.
RR-18A-T01N-SFW	SA	HEX03-001		W	X
RR-13-T01N-SFW	SA	HEX03-002		W	X
RR-13-T01N-SFW 16:35	SA	HEX03-003		W	X
RR-14-T01N-SFW	SA	HEX03-004		W	X
RR-15-T01N-SFW	SA	HEX03-005		W	X
RR-16-T01N-SFW	SA	HEX03-006		W	X
RR-17-T01N-SFW	SA	HEX03-007		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	Yes	
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS RR-13-T01N-SFW • LD	Yes	Matrix spike (MS) and matrix spike duplicate (MSD) analysis was conducted on sample RR-13-T01N-SFW. All the MS and MSD results were within acceptance limits. The MS and MSD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: HEX04 Sampling Event: Fall 2002

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/15/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses
					Hexachrom.
MW-A-T01N-GRW	SA	HEX04-001		W	X
MW-B-T01N-GRW	SA	HEX04-002		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	Yes	
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS MW-B-T01N-GRW • LD	Yes	Matrix spike (MS) and matrix spike duplicate (MSD) analysis was conducted on sample MW-B-T01N-GRW. All the MS and MSD results were within acceptance limits. The MS and MSD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: HEX05 Sampling Event: Fall 2002

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/14/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses
					Hexachrom.
MW-14-T01N-GRW	SA	HEX05-001		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	Yes	
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS MW-14-T01N-GRW • LD	Yes	Matrix spike (MS) and matrix spike duplicate (MSD) analysis was conducted on sample MW-14-T01N-GRW. All the MS and MSD results were within acceptance limits. The MS and MSD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: HEX06 Sampling Event: Fall 2002

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/14/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses
					Hexachrom.
MW-10-T01N-GRW	SA	HEX06-001		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	Yes	
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS MW-10-T01N-GRW • LD	Yes	Matrix spike (MS) and matrix spike duplicate (MSD) analysis was conducted on sample MW-10-T01N-GRW. All the MS and MSD results were within acceptance limits. The MS and MSD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: HEX07 Sampling Event: Fall 2002

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/15/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses
					Hexachrom.
MW-7C-T01N-GRW	SA	HEX07-001		W	X
MW-04-T01N-GRW	SA	HEX07-002		W	X
MW-7A-T01N-GRW	SA	HEX07-003		W	X
MW-9A-T01N-GRW	SA	HEX07-004		W	X
RB01T-GRW	SA	HEX07-005		W	X
MW-7A-T01N-GRW	SA	HEX07-006		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	Yes	
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS MW-7A-T01N-GRW • LD	Yes	Matrix spike (MS) and matrix spike duplicate (MSD) analysis was conducted on sample MW-7A-T01N-GRW. All the MS and MSD results were within acceptance limits. The MS and MSD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB01T-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package included a rinsate blank (RB) sample that was within the control criteria. The field quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: HEX08 Sampling Event: Fall 2002

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/14/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses
					Hexachrom.
MW-11-T01N-GRW	SA	HEX08-001		W	X
MW-12-T01N-GRW	SA	HEX08-002		W	X
MW-13-T01N-GRW	SA	HEX08-003		W	X
MW-15-T01N-GRW	SA	HEX08-004		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	Yes	
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS MW-12-T01N-GRW • LD	Yes	Matrix spike (MS) and matrix spike duplicate (MSD) analysis was conducted on sample MW-12-T01N-GRW. All the MS and MSD results were within acceptance limits. The MS and MSD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: HEX09 Sampling Event: Fall 2002

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/15/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses
					Hexachrom.
MW-1-T01N-GRW	SA	HEX09-001		W	X
MMW-25B-T01N-GRW	SA	HEX09-002		W	X
MMW-29A-T01N-GRW	SA	HEX09-003		W	X
MMW-29B-T01N-GRW	SA	HEX09-004		W	X
MMW-24-T01N-GRW	SA	HEX09-005		W	X
COLUMBINE CAMP GROUND-T01N-GRW	SA	HEX09-006	COLUMBINECG-T01N-GRW	W	X
MMW-35B-T01N-GRW	SA	HEX09-007		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	Yes	
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS MMW-29A-T01N-GRW • LD	Yes	Matrix spike (MS) and matrix spike duplicate (MSD) analysis was conducted on sample MW-29A-T01N-GRW. All the MS and MSD results were within acceptance limits. The MS and MSD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: HEX10 Sampling Event: Fall 2002

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/15/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses
					Hexachrome
MMW-36B-T01N-GRW	SA	HEX10-001		W	X
MMW-17B-T01N-GRW	SA	HEX10-002		W	X
MMW-23A-T01N-GRW	SA	HEX10-003		W	X
MMW-23B-T01N-GRW	SA	HEX10-004		W	X
MMW-34B-T01N-GRW	SA	HEX10-005		W	X
MMW-36B-T01N-GRW	SA	HEX10-006		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	Yes	
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS MMW-17B-T01N-GRW MMW-36B-T01N-GRW • LD	Yes	Matrix spike (MS) and matrix spike duplicate (MSD) analysis was conducted on sample MW-17B-T01N-GRW and a MS analysis on sample MMW-36B-T01N-GRW. The MS and MSD results in MMW-17B-T01Nwere all within acceptance limits. The MS result in sample MMW-36B-T01N-GRW was outside acceptance limits. Tables 1.1 summarize these results and the data qualification issued. The MS and MSD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Table 1.1
Matrix Spike Results And Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
MMW-36B-T01N-GRW					
Hexachrome	41.0	NA	75-125%	NONE	J MS-L parent

NA = Not appropriate

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: HEX11 Sampling Event: Fall 2002

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/15/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses
					Hexachrome
MMW-30A-T01N-GRW	SA	HEX11-001		W	X
MMW-30B-T01N-GRW	SA	HEX11-002		W	X
MMW-31A-T01N-GRW	SA	HEX11-003		W	X
MMW-31A-T01D-GRW	FD	HEX11-004		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	Yes	
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS MMW-31A-T01N-GRW MMW-30B-T01N-GRW • LD	Yes	Matrix spike (MS) and matrix spike duplicate (MSD) analysis was conducted on sample MW-31A-T01N-GRW and a MS analysis on sample MMW-30B-T01N-GRW. The MS and MSD results in MMW-31A-T01N and the 200x dilution of MMW-30B-T01N-GRW were all within acceptance limits. The MS and MSD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate (FD) MMW-31A-T01N-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package included a field duplicate (FD) sample that was within the control criteria. The field quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: HEX12 Sampling Event: Fall 2002

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/15/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses
					Hexachrome
MMW-8B-T01N-GRW	SA	HEX12-001		W	X
MMW-8B-T01D-GRW	FD	HEX12-002		W	X
MMW-13-T01N-GRW	SA	HEX12-003		W	X
MMW-32A-T01N-GRW	SA	HEX12-004		W	X
MMW-19A-T01N-GRW	SA	HEX12-005		W	X
MMW-19A-T01D-GRW	FD	HEX12-006		W	X
MMW-8A-T01N-GRW	SA	HEX12-007		W	X
MMW-8A-T01D-GRW	FD	HEX12-008		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	Yes	
Laboratory Blank Results	No	Hexachrome was detected in the method blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications and bias direction that was assigned.
Matrix QC • MS/MSD/PDS MMW-32A-T01N-GRW MMW-8A-T01N-GRW • LD	Yes	Matrix spike (MS) and matrix spike duplicate (MSD) analysis was conducted on samples MW-32A-T01N-GRW and MMW-8A-T01N-GRW. The MS and MSD results in MMW-32A-T01N and MMW-8A-T01N-GRW were all within acceptance limits. The MS and MSD results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate (FD) MMW-8B-T01D-GRW MMW-19A-T01D-GRW MMW-8A-T01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package included a field duplicate (FD) sample that was within the control criteria. The field quality control results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Table 1.2
Blank Detections Resulting in Qualification

Analyte	MB (mg/L)	RL (mg/L)	Samples Qualified	Qualification Code
Hexachrome	0.0023	0.01	MMW-32A-T01N-GRW, MMW-19A-T01N-GRW, MMW-19A-T01D-GRW	U MB-I

MB = Method Blank RL = Reporting Limit

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: D2J080118 Sampling Event: Fall 2002

Matrix: Solid __ Water _X_ Biota __

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/6/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	Lab ID	Matrix	Analyses						
			Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	Cr(VI)
ERLOUT-T01D-SFW	D2J080118-001	W							X
RRS-9-T01N-SFW	D2J080118-002	W							X
RRS-12-T01N-SFW	D2J080118-003	W							X
ZWERGEL-T01N-SFW	D2J080118-004	W							X
SW12-4-T01N-SFW	D2J080118-005	W							X
SW12-9-T01N-SFW	D2J080118-006	W							X
SW12-6-T01N-SFW	D2J080118-007	W							X
SW12-7-T01N-SFW	D2J080118-008	W							X
SW12-5-T01N-SFW	D2J080118-009	W							X
SW12-10-T01N-SFW	D2J080118-010	W							X
ERLIN-T01N-SFW	D2J080118-011	W							X
ERLMID-T01N-SFW	D2J080118-012	W							X
ERLOUT-T01N-SFW	D2J080118-013	W							X

Matrix: S = Solid W = Water B = Biota

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 24 hour hold time for Hexavalent Chromium was not met for six of thirteen samples. SW12-4-T01N-SFW, SW12-6-T01N-SFW, SW12-7-T01N-SFW, SW12-5-T01N-SFW, and SW12-10-T01N-SFW were qualified as detects (J) for exceeding the hold time. Sample SW12-9-T01N-SFW was qualified as a nondetect (UJ) for exceeding the hold time. Results for hold time reflect an indeterminate bias.
Method Blanks	Yes	
Matrix QC • MS • MS/MSD RRS-9-T01N-SFW ERLIN-T01N-SFW • LD RRS-9-T01N-SFW ERLIN-T01N-SFW	Yes	
Method QC • Surrogates • PDS/GFAA QC • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank • Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	No	The positive values are reported between the MDL and the RL, which reflects a higher degree of uncertainty in the results. See Table 1.1. Sample ERLOUT-T01D-SFW, RRS-9-T01N-SFW, RRS-12-T01N-SFW, SW12-4-T01N-SFW, SW12-6-T01N-SFW, SW12-7-T01N-SFW, SW12-5-T01N-SFW, SW12-10-T01N-SFW, ERLIN-T01N-SFW, ERLMID-T01N-SFW, and ERLOUT-T01N-SFW were qualified as estimated ("J") for the uncertainty in the reporting limit. A bias direction of indeterminate is assigned.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration		
Initial/Continuing Calibration Verification		
Laboratory Control Sample Results		
Compound Identification		
Quantification		
Verification		
Method Specific QC • Thermal stability • Tuning • Mass Calibration • Resolution • ICS		

Table 1.1

Sample	Result	RL	MDL
ERLOUT-T01D-SFW	0.0042	0.010	0.0014
RRS-9-T01N-SFW	0.0015	0.010	0.0014
RRS-12-T01N-SFW	0.0015	0.010	0.0014
SW12-4-T01N-SFW	0.0024	0.010	0.0014
SW12-6-T01N-SFW	0.0042	0.010	0.0014
SW12-7-T01N-SFW	0.0061	0.010	0.0014
SW12-5-T01N-SFW	0.0024	0.010	0.0014
SW12-10-T01N-SFW	0.0033	0.010	0.0014
ERLIN-T01N-SFW	0.0042	0.010	0.0014
ERLMID-T01N-SFW	0.0015	0.010	0.0014
ERLOUT-T01N-SFW	0.0042	0.010	0.0014

General Overall Assessment:

_____ Data are usable without qualification.

___X_ Data are usable with qualification (detailed above).

_____ Some or all data are unusable for any purpose (detailed above).

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: D2J090175 Sampling Event: Fall 2002

Matrix: Solid __ Water _X_ Biota __

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/6/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	Lab ID	Matrix	Analyses						
			Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	Cr(VI)
GOATHILL SPRING-T01N-SFW	D2J090175-001	W							X
UFLMID-T01N-SFW	D2J090175-002	W							X
UFLIN-T01N-SFW	D2J090175-003	W							X
UFLOUT-T01N-SFW	D2J090175-004	W							X
CAPULIN1-T01N-GRW	D2J090175-005	W							X
SPRING39-T01N-GRW	D2J090175-006	W							X
SPRING10-T01N-GRW	D2J090175-007	W							X
SPRING9-T01N-GRW	D2J090175-008	W							X
SW12-2-T01N-SFW	D2J090175-009	W							X
SW12-3-T01N-SFW	D2J090175-010	W							X
SW12-1-T01N-SFW	D2J090175-011	W							X

Matrix: S = Solid W = Water B = Biota

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 24-hour hold time for Hexavalent Chromium was not met. Sample GOATHILL SPRING-T01N-SFW was qualified as detects (J) for exceeding the hold time. Results for hold time reflect an indeterminate

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		bias.
Method Blanks	Yes	
Matrix QC • MS • MS/MSD SW12-1-T01N-SFW • LD SW12-1-T01N-SFW	Yes	
Method QC • Surrogates • PDS/GFAA QC • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank • Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes", "No", or "NA".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration		
Initial/Continuing Calibration Verification		
Laboratory Control Sample Results		
Compound Identification		
Quantification		
Verification		
Method Specific QC • Thermal stability • Tuning • Mass Calibration • Resolution • ICS		

General Overall Assessment:

_____ Data are usable without qualification.

___X_ Data are usable with qualification (detailed above).

_____ Some or all data are unusable for any purpose (detailed above).

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: D2J100114 Sampling Event: Fall 2002

Matrix: Solid __ Water _X_ Biota __

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/6/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	Lab ID	Matrix	Analyses						
			Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	Cr(VI)
ND-1-T01N-SFW	D2J100114-001	W							X
RB-01T-SFW	D2J100114-002	W							X
CD-T01N-SFW	D2J100114-003	W							X
LOWERSPRING13-T01N-GRW	D2J100114-004	W							X

Matrix: S = Solid W = Water B = Biota

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	There were no collection times listed on COCs, times were taken from the sample containers.
Holding Times	Yes	
Method Blanks	Yes	
Matrix QC • MS • MS/MSD • LD	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • PDS/GFAA QC • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank • Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	The laboratory bench sheet had an error reading 1.10 on the CCV true value, instead on 0.10. This made all of the CCVs incorrectly low. The lab did not report this, even though it was an error, in the case narrative. The laboratory was called and corrected laboratory bench sheet was issued.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration		
Initial/Continuing Calibration Verification		
Laboratory Control Sample Results		
Compound Identification		
Quantification		
Verification		
Method Specific QC • Thermal stability • Tuning • Mass Calibration • Resolution • ICS		

General Overall Assessment:

__X__ Data are usable without qualification.

_____ Data are usable without qualification (detailed above).

_____ Some or all data are unusable for any purpose (detailed above).

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: D2K050113 Sampling Event: Fall 2002

Matrix: Solid __ Water _X_ Biota __

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/9/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	Lab ID	Matrix	Analyses						
			Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	Cr(VI)
P-3-T01N-GRW	D2K050113-001	W							X
MMW-43A-T01N-GRW	D2K050113-002	W							X
MMW-11-T01N-GRW	D2K050113-003	W							X
MMW-11A-T01N-GRW	D2K050113-004	W							X
MMW-11A-T01D-GRW	D2K050113-005	W							X
MMW-10A-T01N-GRW	D2K050113-006	W							X
MMW-10B-T01N-GRW	D2K050113-007	W							X
MMW-10C-T01N-GRW	D2K050113-008	W							X
MMW-18B-T01N-GRW	D2K050113-009	W							X
RB03T-GRW	D2K050113-010	W							X
MMW-17A-T01N-GRW	D2K050113-011	W							X

Matrix: S = Solid W = Water B = Biota

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The cooler temperature was 1.3 ^{o} C, which is less than the control limit of 2-6 ^{o} C. This was not mentioned in the case narrative.
Holding Times	Yes	
Method Blanks	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS • MS/MSD MMW-11-T01N-GRW MMW-17A-T01N-GRW • LD MMW-11-T01N-GRW	Yes	
Method QC • Surrogates • PDS/GFAA QC • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate MMW-11A-T01D-GRW • Rinsate Blank RB03T-GRW • Field Blank • Trip Blank • Other (e.g., splits)	Yes	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration		
Initial/Continuing Calibration Verification		
Laboratory Control Sample Results		
Compound Identification		
Quantification		
Verification		
Method Specific QC • Thermal stability • Tuning • Mass Calibration • Resolution • ICS		

General Overall Assessment:

_X_ Data are usable without qualification.

____ Data are usable with qualification (detailed above).

____ Some or all data are unusable for any purpose (detailed above).

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: D2K080117 Sampling Event: Fall 2002

Matrix: Solid __ Water X Biota __

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/13/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	Lab ID	Matrix	Analyses						
			Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	Cr(VI)
EW-1-T01N-GRW	D2K080117-001	W							X
EW-2-T01N-GRW	D2K080117-002	W							X
EW-3-T01N-GRW	D2K080117-003	W							X
EW-4-T01N-GRW	D2K080117-004	W							X
EW-5A-T01N-GRW	D2K080117-005	W							X
EW-5B-T01N-GRW	D2K080117-006	W							X
MW-17-T01N-GRW	D2K080117-007	W							X
OUTFALL002-T01N-GRW	D2K080117-008	W							X
EW-5D-T01N-GRW	D2K080117-009	W							X
EW-6-T01N-GRW	D2K080117-010	W							X
MMW-31B-T01N-GRW	D2K080117-011	W							X
US-1-T01N-GRW	D2K080117-012	W							X
RB07T-GRW	D2K080117-013	W							X
US-2-T01N-GRW	D2K080117-014	W							X
US-3-T01N-GRW	D2K080117-015	W							X
SPRING14-T01N-GRW	D2K080117-016	W							X
CLOUMBINE2-T01N-GRW	D2K080117-017	W							X

Matrix: S = Solid W = Water B = Biota

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks	Yes	
Matrix QC • MS • MS/MSD • LD	NA	
Method QC • Surrogates • PDS/GFAA QC • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	NA	
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank • Other (e.g., splits)	Yes	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration		
Initial/Continuing Calibration Verification		
Laboratory Control Sample Results		
Compound Identification		
Quantification		
Verification		
Method Specific QC • Thermal stability • Tuning • Mass Calibration • Resolution • ICS		

General Overall Assessment:

__X__ Data are usable without qualification.

_____ Data are usable without qualification (detailed above).

_____ Some or all data are unusable for any purpose (detailed above).

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: D2K140139 Sampling Event: Fall 2002

Matrix: Solid __ Water _X__Biota __

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/24/02

Peer Reviewer: Stacey Coker Date Completed: 10/21/03

The table below summarizes the results presented in this data package.

Field ID	Lab ID	Matrix	Analyses						
			Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	Cr(VI)
MMW-44A-T01N-GRW	D2J080118-001	W							X

Matrix: S = Solid W = Water B = Biota

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 24 hour hold time for Hexavalent Chromium was not met. Sample MMW-44A-T01N-GRW was qualified as a nondetect (UJ) for exceeding the hold time. Results for hold time reflect an indeterminate bias.
Method Blanks	Yes	
Matrix QC • MS • MS/MSD MMW-44A-T01N-GRW • LD MMW-44A-T01N-GRW	No	The Matrix Spike (MS) recovery was more than 30% below the lower lab limit. Sample MMW-44A-T01N-GRW was qualified as unusable "R" for non-detect results. However, the client did not request the matrix spike performed on this sample.
Method QC • Surrogates • PDS/GFAA QC • Serial Dilution • Internal Standards	NA	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
• Total vs. Partial Analyses • Cation/Anion Balance		
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank • Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes," "No," or "NA."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration		
Initial/Continuing Calibration Verification		
Laboratory Control Sample Results		
Compound Identification		
Quantification		
Verification		
Method Specific QC • Thermal stability • Tuning • Mass Calibration • Resolution • ICS		

General Overall Assessment:

____ Data are usable without qualification.

____ Data are usable without qualification (detailed above).

__X__ Some or all data are unusable for any purpose (detailed above).

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE DECEMBER 2002 SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

May 2004

URS

URS Corporation
8181 E. Tufts Avenue
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140655

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Summary of Reanalyses Due to Matrix Related Analyses Issues 2-1

Section 3 Data Review Process 3-1

Section 4 Data Review Commentary 4-1

4.1 Data Review Narratives 4-1
4.2 General Data Quality Issues 4-1
4.2.1 Holding Blanks 4-1
4.2.2 Manual Integration 4-1
4.2.3 Low-Level Detections 4-1
4.2.4 TICS Reported In Blanks 4-1
4.2.5 Dilution Schemes/Non-Detects With Elevated Rls 4-2
4.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses: 4-2
4.2.7 Non-Valid Matrix Spikes 4-2
4.2.8 Laboratory Performance Review (LPR) Findings 4-2

Section 5 Collective Summary/Assessment of Matrix QC Results 5-1

5.1 Matrix Spike Results (Accuracy Evaluation) 5-1
5.2 Spike Duplicate Results and Laboratory Duplicates (Precision Evaluation) 5-3
5.2.1 Organic Analyses (MS/MSD Relative Percent Difference (RPD)) 5-3
5.2.2 Metals and Inorganic Laboratory Duplicates 5-3
5.3 Serial Dilution Results 5-3

Section 6 Collective Summary/Assessment of Field QC Results 6-1

6.1 Field Duplicate Samples 6-1
6.2 Rinsate Blank Results 6-2
6.3 Field Blank Results 6-4

Section 7 Overall Data Quality Indicator Assessment 7-1

7.1 Precision 7-1
7.2 Accuracy 7-1
7.3 Completeness 7-1
7.4 Representativeness 7-1
7.5 Comparability 7-2
7.6 Sensitivity 7-2

TABLE OF CONTENTS

List of Tables

Table 1-1 Summary of December 2002 Groundwater Sample Collection

Table 2-1 Re-analyses Summary for Water Samples Collected During December 2002

Table 5-1 Field Samples Submitted for Matrix Spike/Matrix Spike Duplicates

Table 5-2 Frequency of Matrix Spike Samples Collected in December 2002

Table 5-3 Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Table 5-4 Serial Dilution Outliers and Corresponding Results Qualification for Groundwater Samples

Table 6-1 Groundwater Samples Submitted for Field Duplicate Analyses

Table 6-2 Field Duplicate Collection Frequency for the December 2002 Sampling Event

Table 6-3 Groundwater Field Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Table 6-4 Rinsate Blanks Collected During the December 2002 Sampling Event

Table 6-5 December 2002 Groundwater Rinsate Blank Detections and Resulting Data Qualification

List of Attachments

Attachment 1.1 Data Package WAT028

Attachment 1.2 Data Package WAT029

Attachment 1.3 Data Package WAT030

Attachment 1.4 Data Package WATRAA1

Attachment 1.5 Data Package WATRAF1

This data validation report is intended to provide the reader with a general overview of the usability of chemical data obtained from the December 2002 sampling activities at Molycorp. In addition, this data validation report is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

This report contains the results of the data validation conducted for groundwater samples collected in December of 2002 at the Molycorp Questa Mine, Questa, New Mexico. These water samples were collected in support of the Remedial Investigation/Feasibility Study (RI/FS). The water samples were sent to Severn Trent Laboratories (STL) Burlington in Colchester, VT. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods used and quality control samples collected were in accordance with the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). The results were reported in 3 original and 2 re-analyses data packages. Table 1 presents a summary of the number of field and quality control samples collected for each analysis type.

Table 1-1
Summary of December 2002 Groundwater Sample Collection

Sample Identification	Dissolved Metals	Total Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
MMW-17A-D01N-GRWREM	X, MS, LD	X, MS, LD	X, MS, LD			
MMW-17B-D01N-GRWREM	X	X	X			
MMW-31B-T01N-GRW	X, RB	X, RB	X, RB			X, RB
MMW-42B-T01N-GRW	X	X	X			
MMW-44A-T01N-GRW	X, FD	X, FD	X, FD	X, FD	X, FD	X, FD
MMW-44B-T01N-GRW	X	X	X	X	X	X
MMW-47A-T01N-GRW	X, MS, LD	X, MS, LD	X, MS, LD	X, MS/MSD	X, MS/MSD	X, MS/MSD
MMW-48A-T01-GRW	X	X	X	X, FB	X, FB	X, FB
MW-17-T01N-GRW	X,RB	X,RB	X,RB	X,RB	X,RB	
MW-20-T01N-GRW	X	X	X			
MW-24-T01N-GRW	X,RB	X,RB	X,RB			
MW-9A-T01N-GRW	X	X	X			
MW-1-T01N-GRW	X, FD	X, FD	X, FD			
EW-5C-T01N-GRW	X	X	X			
Number GW samples	14	14	14	5	5	5
Number MS/MSD or MS/LD	2	2	2	1	1	1
Number Field Duplicates	2	2	2	1	1	1
Number Rinsate Blanks	2	2	2	1	1	1
Number Field Blanks	NA	NA	NA	1	1	1

GRW = suffix indicating groundwater sample FB = Field Blank RB = Rinsate Blank NA = Not Applicable
FD = Field Duplicate MS/MSD = Matrix Spike/Matrix Spike Duplicate LD = Laboratory Duplicate MS = Matrix Spike
REM = Reanalysis of monthly groundwater sample (in contrast to quarterly groundwater sample)

Notes:
For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".
For field duplicate samples, the "T01N" and "D01N" components of the field ID were replaced with "T01D" and "D01D", respectively.

The QAPP required that the quality control samples listed above be collected at a frequency of 5%. As illustrated by the table, the frequency of QC analyses was satisfied for each analysis type.

During review of the October and December 2002 groundwater data sets, it became apparent that there were matrix-related analysis problems. The serial dilution results, comparisons with historical results, and charge balances suggested that matrix-related issues existed for the metals analysis, sulfate analysis, and fluoride analysis. The laboratory conducted several studies in order to determine analysis solutions to the matrix related analysis problems. Each analysis problem, investigation, and solution is described in detail in the Data Validation Report for the Fall 2002 Groundwater and Surface Water samples. As a result of this matrix related analysis problems and subsequent studies, various samples required reanalysis, as summarized below.

- All December 2002 samples for which the charge balances were outside of acceptance limits were reanalyzed for sulfate using EPA Method 375.4.
- All December 2002 samples for which the aluminum concentrations were greater than 3 mg/l were reanalyzed for fluoride. For the reanalyses, samples were diluted, based on the aluminum concentration, prior to addition of the chelating buffer.
- All December 2002 samples for which the cation/anion balance was out of limits or the metals concentrations did not compare well with historic results were reanalyzed for dissolved metals using the applicable dilution scheme.

A summary of the December 2002 samples which were re-analyzed is provided in the following table. The table includes a listing of the data package in which the original results were reported and the data package in which the reanalysis results are reported.

Table 2-1
Re-analyses Summary for Water Samples Collected During December 2002

Site ID	pH	Units	Sample Round	pH Category	Dissolved Metals (“-D01N-“)	Sulfate (“-T01N-”)	Fluoride (“-T01N-”)	Original SDG
MMW-17A	4.39	SU	0212	A	WATRAA1	WATRAA1	WATRAF1	WAT028
MMW-17B	5.13	SU	0212	A	WATRAA1	WATRAA1	WATRAF1	WAT028
MMW-48A	5.52	SU	0212	A			WATRAF1	WAT030

As noted in Section 4, the results for the reanalyses were reviewed in the same fashion as the original analyses. As a result of this review, the results obtained for reanalyses were selected for reporting.

As noted in the table above, the re-analyses for metals was limited to the dissolved metals fraction. As such, the total metal sample results for samples MMW-17A and MMW-17B required qualification as unusable (R) because they were not analyzed in accordance with the dilution schemes that resulted from the studies. The assigned reason and bias codes assigned to the total metals results for the four samples listed in the table are “DL, Hist - L”. The “DL” reason code was used because it was the serial dilution results that suggested that pH-dependent matrix-related analysis problems existed. The “Hist” reason code was added to indicate that results obtained did not compare well with historic data, which further supported the presence of an analysis problem as implied by the serial dilution results. The bias direction of low was assigned because the historic sample results available for these locations were generally higher than the December sample results.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, Inductively Coupled Plasma Spectroscopy (ICP) serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1, and is as follows: If no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used. If no criteria are specified in the SOP or the QAPP then the method-specified acceptance limits were used. If no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

Whenever professional judgement was exercised in evaluating the need for qualification, the basis for the professional judgement is provided in the data review narrative. As described in Section 2, some samples were re-analyzed for dissolved metals, sulfate, and/or fluoride due to matrix conditions unique to the Molycorp Site. The reanalysis packages received the same review as the original packages. In all cases, the reanalysis results supersede those that were initially reported. Section 4 and Attachment 1 provide the data review narratives for each of the data packages, including the reanalysis packages.

After completing the review sample-specific and laboratory performance parameters in accordance with SOP 12.1, the site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. The reason for this is that site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC

measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 5.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Where applicable, the potential direction of bias (high, low, or indeterminate) has been indicated on the tables in the text, and noted on the sample results sheets as H, L, or I, respectively. Section 6.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 7.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

4.1 DATA REVIEW NARRATIVES

The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries, which are included in Attachment 1. The data qualifiers, reason codes, and bias codes have been marked on the data sheets, which are retained in the project files. The data validation qualifiers reason codes and bias codes are also stored in the electronic database.

4.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identified whether findings globally affect all relevant water samples analyzed for the December 2002 Groundwater and Surface Water Sampling Event. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

4.2.1 Holding Blanks

For the analysis of the volatile organic samples, a holding blank was carried through the sample storage period and analyzed in the same sequence as the samples in the data package. As all holding blank recoveries were all nondetect, the indication of the occurrence of potential cross-contamination during sample storage was unlikely.

4.2.2 Manual Integration

Manual integration was employed in deriving results for the volatile and semivolatile organics in a few data packages. The values that were derived from manual integration were qualified on the quantitation reports and extracted ion current profiles were included for each instance. The supporting documentation provided was reviewed and found to be adequate.

4.2.3 Low-Level Detections

Detected organic analytes with concentrations between the Method Detection Limit (MDL) and the Reporting Limit (RL) were qualified as estimated (J). A qualifier code of “SQL-I” (Sample Quantitation Limit) was assigned to reflect the greater uncertainty in quantitative values below the RL.

4.2.4 TICS Reported in Blanks

Several Tentatively Identified Compounds (TICs) were reported as present in the semivolatile blanks for each package. The unknown compounds detected in the method blank were qualified as (NJ) to denote the analyses indicated the presence of an analyte that had been “tentatively identified” and the associated numerical value represented its approximate value. However, if similar TICs were present in the associated samples, the results were not considered to be reportable due to laboratory contamination (as indicated by the blank) and therefore, flagged as unusable (R). After evaluating sample TICs based on laboratory method blanks, any remaining TICs were qualified as “NJ.”

4.2.5 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

4.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses:

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilbria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

4.2.7 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

4.2.8 Laboratory Performance Review (LPR) Findings

As mentioned previously, one data package, WAT028, was given a full validation to assess the performance of the laboratory for all analyses. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated for all packages for this event included:

- Initial calibration results for VOCs and SVOCs
- Continuing calibration results for VOCs and SVOCs

The site-specific Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, method duplicate (MD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three sections present a discussion on the MS/MSD analyses, MD analyses, and the serial dilution results for the groundwater samples collected during the December, 2002 sampling event.

5.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Additional aliquots of two groundwater samples were submitted for use in matrix QC analyses. Table 5-1 below summarizes the site-samples that were used to prepare matrix spike and matrix spike duplicate samples.

Table 5-1
Field Samples Submitted for Matrix Spike/Matrix Spike Duplicates

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Wet Chemistry	Volatile Organics	Semivolatile Organics	Explosives
MMW-17A-T01N-GRW MMW-17A-D01N-GRW	Groundwater	WAT030	x		x			
MMW-17A-T01N-GRW MMW-17A-D01N-GRW	Groundwater	WATRAA1		x	Sulfate Only			
MMW-47A-T01N-GRW MMW-47A-D01N-GRW	Groundwater	WAT028	x	x	x	x	x	x

Notes:
1. For metals and inorganic analyses, a single matrix spike sample was analyzed.
2. For organic analyses, duplicate matrix spike samples were analyzed.

The following table summarizes the number of groundwater MS/MD sample sets relative to the number of field samples.

Table 5-2
Frequency of Matrix Spike Samples
Collected in December 2002

Analyses	Number of MS samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	2	14	14
Dissolved Metals	2	14	14
Wet Chemistry	2	14	14
VOC	1	5	20
SVOC	1	5	20
Explosives	1	5	20

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

Although the vast majority of matrix spike recoveries were within acceptance limits, some were not. Table 5-3 summarizes the spike recoveries that were outside acceptance limits and the subsequent result qualification applied to the associated samples. Please note that the shaded areas in the table correspond to spike analyses performed on samples which were re-analyzed.

In general, matrix spike qualification was extended to the balance of the data set for the event if more than a quarter of the spike recoveries were out. However, the reviewer also considered other factors such as the average matrix spike recovery, the magnitude of the outages, and the number of valid spike recoveries relative to the size of the data set.

Table 5-3
Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte (Control Limits %)	Sample ID	MS or MS/ MSD (%R)	Frequency of Limit Exceedance	Action
METALS				
Copper (75-125)	*MMW-17A-D01N-GRWREM*	*140.5*	1 of 2	J MS-H for all positive dissolved copper sample results.
Cadmium (75-125)	*MMW-17A-D01N-GRWREM*	*182.3*	1 of 2	J MS-H for all positive dissolved cadmium sample results.
Cobalt (75-125)	*MMW-17A-D01N-GRWREM*	*130.6*	1 of 2	J MS-H for all positive dissolved cobalt results.
Cyanide (75-125)	MMW-48A-T01N-GRW	11.5	1 of 2	J/UJ MS-L for all sample results.[1]
WET CHEMISTRY				
TKN (75-125)	MMW-48A-T01N-GRW	41.5	1 of 2	J/UJ MS-L for all sample results.
VOC				
All results were within acceptance criteria and data qualification was not necessary				
SVOC				
All results were within acceptance criteria and data qualification was not necessary				
EXPLOSIVES				
PYX (70-130)	MMW-47A-T01N-GRW	16 and 14	1 of 2	J/UJ MS-L for all sample results.
PETN (75-110)	MMW-47A-T01N-GRW	74 and 76	1 of 2	No qualification was considered necessary because one recovery was only slightly low and the average recovery was within the acceptance range.

[1] It was not considered necessary to reject non-detects for cyanide even though the MS recovery was <30% because the acidic nature of the sample, (pH = 5.5, would not allow for cyanide to be formed or persist in the natural environment.
REM = Reanalysis of monthly sample (in contrast to quarterly sample which was also reanalyzed but is covered by the analogous report for Fall 2002 groundwater samples)

For each of the analytes listed in the table above, it was considered necessary to extend qualification to the balance of the December 2002 groundwater samples data set because more than a quarter of the spike results were outside acceptance limits.

Although results for some analytes were qualified based on matrix spike recoveries, none warranted rejection. Additionally, the vast majority (97%) of matrix spike results were within acceptance limits. As such, the overall level accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

5.2 SPIKE DUPLICATE RESULTS AND LABORATORY DUPLICATES (PRECISION EVALUATION)

The following subsections pertain to the precision of analytical results based upon their reproducibility. Section 5.2.1 discusses the organic analyses for which precision was evaluated by analysis of duplicate spiked samples. Section 5.2.2 discusses the metals and inorganic analyses for which precision was evaluated by analysis laboratory duplicate.

5.2.1 Organic Analyses (MS/MSD Relative Percent Difference (RPD))

The relative percent differences between MS and MSD results for target analytes contained in the spiking solutions used by the laboratory were within the QAPP acceptance limits. No groundwater sample results were qualified based on the RPD between the MS and the MSD results. As such, the precision of the organic analyses relative to the site-specific matrix is considered to be acceptable.

5.2.2 Metals and Inorganic Laboratory Duplicates

The laboratory duplicate sample analysis results are used to evaluate the precision of the laboratory analyses. The evaluation criteria used are dependent on the concentration of the analyte in the sample. Acceptable precision is demonstrated by an RPD<20% when both results are more that five times the reporting limit (RL). When either sample concentration is <5xRL, acceptable precision is demonstrated by an absolute difference between results of < 1xRL. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was used as the RL for these concentration dependent evaluations because the laboratory reported the IDLs as the quantitative RLs. The IDLs are considered to be too low for such comparisons to be meaningful. Additionally, using the CLP CRDL is consistent with The National Functional Guidelines, which were used as guidance for data review in addition to SOP 12.1

All laboratory duplicate results satisfied the applicable evaluation criterion. Therefore, no qualifications of data were necessary on the basis of laboratory duplicate results. As such, the laboratory duplicate results are considered to indicated that acceptable levels of overall precision (sampling and analytical) were attained on the site-specific matrix.

5.3 SERIAL DILUTION RESULTS

ICP serial dilutions are analyzed to help evaluate whether or not interferences exist due to sample matrix. When analyte concentrations are sufficiently high (defined as minimally 50x greater than the instrument detection limit [IDL}), results for a straight and five fold dilution are expected to agree within 10%. Otherwise interferences resulting in signal suppression or enhancement might be suspected.

In general, qualification was limited to parent samples if less than a quarter of the results were out and extended to the remainder of the data set if more than a quarter of the results were out. However, the data reviewer also considered other factors such as the average %D, the magnitude of outages, and the number of applicable measurements relative to the size of this data set.

Table 5-4 below lists the groundwater samples that were used to perform serial dilution tests and analytes for which the evaluation was applicable. With two exceptions denoted in the table

below, the percent differences (%Ds) between the original sample results and the result obtained from a five-fold diluted sample were all <10%.

Table 5-4
Serial Dilution Outliers and Corresponding Results
Qualification for Groundwater Samples

Analyte	Number of Valid Results	%Ds >10%	Potential Bias Direction		Action
			Low	High	
Total Manganese	2	1	1	0	J DL-L for all samples
Total Zinc	2	1	1	0	J DL-L for all samples

Data qualification was issued to all samples for manganese and zinc results because greater than a quarter of the applicable results were outside the evaluation criterion. The manganese and zinc results were qualified as estimated with a potential low bias (J/UJ DL-L).

The site-specific field duplicate samples, rinsate blanks and field blanks were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrices. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

6.1 FIELD DUPLICATE SAMPLES

The field duplicate sample analysis results may be used to evaluate the overall precision of the analyses (analytical and sampling precision) and/or the sample representativeness. The following concentration dependent evaluation was used. Where both results were greater than or 5 times the Reporting Limit (RL), the Relative Percent Difference (RPD) between the results was compared to a criterion of <25%. If either result was less than 5 times the RL, the absolute difference was compared to a criterion of <2xRL. Similar to the laboratory duplicate evaluations, the CRDL was used as the RL for these comparisons.

Field duplicate samples were collected during this sampling event for metals, wet chemistry, Volatile Organic Compounds (VOCs), Semivolatile Organic Compounds (SVOCs), and explosives. Tables 6-1 and 6-2 below summarize the field duplicate samples collected and the frequency of field duplicate collection per analysis type, respectively.

Table 6-1
Groundwater Samples Submitted for Field Duplicate Analyses

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Wet Chemistry	Volatile Organics	Semivolatile Organics	Explosives
MW-1-T01N-GRW / MW-1-T01D-GRW	Groundwater	WAT030	x		x			
MW-1-D01D-GRW / MW-1-D01D-GRW				x				
MMW-44A-T01N-GRW/ MW-44A-T01D-GRW	Groundwater	WAT028	x		x	x	x	x
MMW-44AD01N-GRW/ MMW-44A-D01D-GRW				x				

Table 6-2
Field Duplicate Collection Frequency for the December 2002 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
Total Metals	2	14	14
Dissolved Metals	2	14	14
Wet Chemistry	2	14	14
VOC	1	5	20
SVOC	1	5	20
Explosives	1	5	20

As shown on the above table, the 5% (or 1 in 20) frequency specification for field duplicates was met for the groundwater samples collected in December 2002.

The groundwater field duplicate results outside the evaluation criteria and resultant data qualification are summarized in Table 6-3 below.

Table 6-3
Groundwater Field Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Sample ID	Analyte	RPD or Absolute Difference as a Function of RL	Frequency of Exceedance	Action
WET CHEMISTRY				
MMW-44A-T01N/T01D-GRW	Phosphorus	34%	1 of 2	J/UJ FD-I for all samples
MW-1-T01N/T01D-GRW	TSS	33%	1 of 2	J/UJ FD-I for all samples
METALS				
All results were within criteria; data qualification was not necessary.				
VOC				
All results were within criteria; data qualification was not necessary.				
SVOC				
All results were within criteria; data qualification was not necessary.				
EXPLOSIVES				
All results were within criteria; data qualification was not necessary.				

Data qualification for phosphorus and TSS was extended to all samples because greater than a quarter of the field duplicate results were outside the applicable evaluation criterion. The results were qualified as estimated with an indeterminate bias direction.

Although some results were qualified based on field duplicate agreement, the vast majority (> 99%) of the field duplicate results were within limits.

6.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. The table below lists the rinsate blanks that were collected during the December 2002 sampling event and the parameters for which they were analyzed.

Table 6-4
Rinsate Blanks Collected During the December 2002 Sampling Event

Sample ID (Date)	Matrix	Data Package	Total Metals	Dissolved Metals	Wet Chemistry	Volatile Organics	Semivolatile Organics	Explosives
RB01T-GRW (12/5)	Groundwater	WAT030	x	x	x		x	x
RB02T-GRW (12/5)	Groundwater	WAT030	x	x	x	x		x

The QAPP required frequency of 5% for the collection of rinsate blanks was met for the December, 2002 water sampling event.

The rinsate blank detections results and the resulting data qualification issued is summarized in the following table. To mitigate the potential effects of cross-contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result or biasing the average high by using the reporting limit.

Table 6-5
December 2002 Groundwater Rinsate Blank Detections and Resulting Data Qualification

Analyte	Sample ID	Conc.	Ave. RB Conc.	RL	Frequency of Detection	Range for Field Samples	Action
METALS (ug/l)							
Aluminum	RB02T-GRW (12/05)	13.8	9.4	10.6	1 of 2	6 – 261,000	Total aluminum results <47.0 ug/l were qualified as nondetect (U RB-I).
Calcium	RB01T-GRW (12/05)	163	111.5	120	1 of 2	40,700 – 640,000	None necessary as all total calcium results for field samples are >5x the average RB concentration.
Copper	RB02T-GRW (12/05)	18.8	9.55	0.6	1 of 2	0.6 – 4,990	Total copper results <47.8 ug/l were qualified as nondetect (U RB-I).
Manganese	RB01T-GRW (12/05)	2.2	1.225	0.5	1 of 2	1.3 – 37,200	Total manganese results <6.13 ug/l were qualified as nondetect (U RB-I).
Zinc	RB01T-GRW (12/05)	15.4	10.25	3.9	1 of 2	3.9 – 9,250	Total zinc results <51.3 ug/l were qualified as nondetect (U RB-I).
	RB02T-GRW (12/05)	5.1		3.9	1 of 2		
INORGANIC PARAMETERS (mg/L)							
TSS	RB01T-GRW (12/05)	1.2	1.55	0.5	2 of 2	0.5 - 331	All TSS results <2.93 mg/l were qualified as nondetect (U RB-I).
	RB02T-GRW (12/05)	1.9		0.67			
Bicarbonate Alkalinity	RB01T-GRW (12/05)	1.1	1.15	1.0	2 of 2	1 – 465	All bicarbonate alkalinity results <5.75 mg/l were qualified as nondetect (U RB-I).
	RB02T-GRW (12/05)	1.2		1.0			
Total Alkalinity	RB01T-GRW (12/05)	1.1	1.15	1.0	2 of 2	1 – 465	All total alkalinity results <5.75 mg/l were qualified as nondetect (U RB-I).
	RB01T-GRW (12/05)	1.2		1.0			
Ammonia as N	RB01T-GRW (12/05)	0.027	0.0195	0.024	1 of 2	0.024 – 0.48	All ammonia results <0.098 mg/l were qualified as nondetect (U RB-I).
Orthophosphate	RB02T-GRW (12/05)	0.14	0.0725	0.01	1 of 2	0.01 – 0.11	All orthophosphate results <0.363 mg/l were qualified as nondetect (U RB-I).
Phosphorus	RB01T-GRW (12/05)	0.01	0.0075	0.01	1 of 2	0.01 0.23	All phosphorus results <0.038 mg/l were qualified as nondetect (U RB-I).

Analyte	Sample ID	Conc.	Ave. RB Conc.	RL	Frequency of Detection	Range for Field Samples	Action
VOC (µg/L)							
1,1,2-trichloro-1,2,2-trifluoro-methane	RB02T-GRW (12/05)	1 J	0.75[1]	10	1 of 1	All results ND at RL of 10.	All sample results were nondetect.
Acetone	RB02T-GRW (12/05)	3 J	1.75[1]	10	1 of 1	All results ND at RL of 10.	All sample results were nondetect.
Chloroform	RB02T-GRW (12/05)	8 J	4.25[1]	10	1 of 1	All results ND at RL of 10.	All sample results were nondetect.
SVOC (µg/L)							
All rinsate blank results were non-detect.							
EXPLOSIVES							
All rinsate blank results were non-detect.							

J = Reported value is considered to be an estimated value because it is between the MDL and RL.
ND = Nondetect MDL = Method Detection Limit RL = Reporting Limit
[1] In calculating the average RB concentrations for organics, a value of 1 was used for nondetect results, rather than the CRQL, as this value was considered more representative of the level down to which the laboratory reports positive results.

While some results were qualified as nondetect based on rinsate blank results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at relatively low levels.

6.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. In accordance with the project QAPP, field blanks were only required for organic parameters. Field blanks were generated by pouring laboratory-supplied reagent grade water into certified pre-cleaned sample containers at the sample collection site.

There was one VOC and SVOC detection for field blank sample FB01T-GRW. These detections are summarized in the table below.

Field Blank ID	Analyte	Concentration ug/L	RL	Associated Sample Results
FB01T-GRW (12/05)	Chloroform	8 J	10	No qualification was necessary because all VOC and SVOC results for field samples were nondetect
FB01T-GRW (12/05)	bis (2-ethylhexyl) phthalate	14	10	

The field blank results suggest that potential contamination of field samples due to ambient field conditions was unlikely as no target organic analytes were detected in field samples.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank contamination. In addition, some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summaries. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

7.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

Of 138 lab duplicate results, all satisfied the applicable evaluation criterion, for a total of 100%. Of 250 field duplicate results, 248 satisfied the applicable evaluation criterion, for a total of 99 %. As such, the overall level of precision, both analytical and combined analytical and sampling, demonstrated is considered to be acceptable.

7.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of Laboratory Control Samples (LCSs) and MSs.

Ninety-seven percent of the MS recoveries (241 of the 248 recoveries with applicable spike levels) satisfied the applicable evaluation criteria for accuracy specified in the QAPP. As such, the overall level of accuracy was attained with respect to the site matrix is considered to be acceptable.

7.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements in relation to the number of measurements requested.

There were 14 groundwater samples collected during the December 2002 sampling event. All samples yielded valid results for all target analytes, consequently the completeness achieved was 100%.

7.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting Field Sampling Plan FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the groundwater samples. The close agreement between the field duplicate results, as discussed above in Section 6.1, indicates that the samples collected were adequately representative of the medium sampled.

Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. Again, the close agreement between laboratory duplicates noted in Section 5.2 indicates that sample processing and subsampling procedures were acceptable.

7.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

7.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. As such, obtaining some nondetect results with elevated reporting limits was not avoidable. While it is anticipated that all data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits in meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT028 Sampling Event: Fall 2002

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 02/02/03

Peer Reviewer: Alan Roberts Date Completed: 08/04/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
TB80T-GRW	TB	511659		W			X				
MMW-47A-T01N-GRW	SA	511660	MMW47AT01NGRW or 47A-GRW or MW47AT01N	W	X	X	X	X	X		
MMW-47A-D01N-GRW	SA	511661		W	X						
MMW-17A-T01N-GRW	SA	511793		W	X	X					
MMW-17A-D01N-GRW	SA	511794		W	X						
MMW-17B-T01N-GRW	SA	511795		W	X	X					
MMW-17B-D01N-GRW	SA	511796		W	X						
MMW-44A-T01N-GRW	SA	511797	44A-T01N-GRW or MMW44AT01NGRW	W	X	X	X	X	X		
MMW-44A-D01N-GRW	SA	511798		W	X						
MMW-44A-T01D-GRW	FD	511799	MMW44AT01DGRW or 44A-T01D-GRW	W	X	X	X	X	X		
MMW-44A-D01D-GRW	FD	511800		W	X						
MW-9A-T01N-GRW	SA	511801		W	X	X					
MW-9A-D01N-GRW	SA	511802		W	X						
TB30T-GRW	TB	511803		W			X				
TB78T-GRW	TB	511867		W			X				
MW-17-T01N-GRW	SA	511868	MW17T01NGRW or 17-T01N-GRW	W	X	X	X	X			
MW-17-D01N-GRW	SA	511869		W	X						
MMW-19B-T01N-GRW	SA	511870	MW19BT01NGRW	W	X	X			X		
MMW-19B-D01N-GRW	SA	511871		W	X						
MW-20-T01N-GRW	SA	511872		W	X	X					
MW-20-D01N-GRW	SA	511873		W		X					

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

During the ICP/MS analysis for selenium, the sample with associated continuing calibration standards designated as CCV1, CCV4, and CCV5 yielded a selenium percent recovery that was less than 90% but greater than 85%. This was considered acceptable accuracy and no qualification of the associated data was considered necessary.

The original Total Dissolved Solids (TDS) analyses, which were performed within the holding time limit, yielded a net weight after drying that greatly exceeded the upper limit of the method for some samples. The affected samples were re-analyzed using a smaller sample volume. The re-analyses were conducted outside of the holding time. The results for the re-analyses were comparable to the original analyses. The results from the re-analyses have been formally reported in the case submittal. Table 1.1 below summarizes the qualification for TDS holding time.

The original sulfate analysis for sample MW-47A-T01N-GRW was performed within the prescribed holding time. However, during the data review process it was discovered that this sample required additional dilution analysis, which was performed 8 days outside the prescribed holding time. The result from this dilution has been formally presented in this SDG. The sulfate result for MW-47A-T01N-GRW has been qualified as estimated J.

Molybdenum was reported from a trace ICP analysis for the samples in this SDG due to the presence of interference that resulted in the failure of the associated internal standard during the ICP/MS analysis. No qualification in the associated data was considered necessary.

A volatile organic holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank have been included in the SDG and is labeled HBW028.

Manual integration was employed in deriving results for the volatile and semi-volatile organics analyses in this SDG. The values that have been derived from manual integration are qualified by the laboratory on the quantitation reports and extracted ion current profiles are included in the SDG.

The nitroaromatics analysis of laboratory control samples D1LCS and D1LCSD yielded a slightly low percent recovery (LCS=60%, LCSD=65%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time; therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were problems noted with sample receipt. Sample MW-17-T01N-GRW was inadvertently marked on the COC for Explosives analysis, however, no volumes were sent for the analysis. The laboratory was contacted and the correction was made so that this sample was not logged in for Explosives analysis. The laboratory noted that several samples for cyanide analysis were received at an improper pH, which may have resulted in possible loss of cyanide. The affected samples are MMW-47A-T01N-GRW, and MMW-44A-T01D-GRW. The nondetect results were qualified as estimated (UJ). The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	The 48-hour holding time was exceeded by less than 24 hours for nitrate as N, nitrite as N, and orthophosphate and the 7-day hold time was exceeded by less than 2 days for TDS. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Antimony, boron, chromium, potassium, manganese, selenium, 1,2-Dibromo-3-chloropropane, 1,2,4-trichlorobenzene, and Bis (2-Ethylhexyl) phthalate were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKE2. TICs in method blanks are not considered to be reportable as TICs for samples and their identification as TICs was rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC MS/MSD/PDS MMW-47A-T01N-GRW MMW-17A-T01N-GRW LD MMW-47A-T01N-GRW MMW-17A-T01N-GRW Tentativelty Identified Compounds (TICs)	No	The matrix spike (MS) percent recovery for some analytes was out of limits in sample MMW-47A-T01N-GRW, and MMW-17A-T01N-GRW. Table 1.3 summarizes these matrix spike results. The matrix spike results for the December 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment For laboratory duplicate analysis of samples MMW-47A-T01N-GRW and MMW-17A-T01N-GRW, the bicarbonate alkalinity and total alkalinity result agreement did not meet acceptance criteria. Table 1.4 summarizes these results. The laboratory duplicate results for the December 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment
Method QC Surrogates Serial Dilution MMW-17A-D01N-GRWL MMW-17A-T01N-GRWL MMW-47A-D01N-GRWL MMW-47A-T01N-GRWL Internal Standards Total vs. Partial Analyses Cation/Anion Balance	No	The surrogate recovery for the explosive analysis was low in sample MW-19B-T01N-GRW. The recovery of 1,2-dinitrobenzene was 82%. This recovery is outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Because the surrogate recovery is lower than the acceptance limit but greater than 10%, all explosive results for sample MW-19B-T01N-GRW were qualified as estimated (UJ). Recoveries for internal standards Y was high for the ICPMS analysis of samples MMW-44A-T01N-GRW, MMW-44A-D01N-GRW, MMW-44A-T01D-GRW, MMW-44A-D01D-GRW, MW-47A-T01N-GRW, and MW-47A-D01N-GRW. Therefore, all molybdenum samples were reanalyzed and reported by trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The serial dilution test for sample MMW-17A-D01N-GRWL was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 6 of the 24 metals. For each of these 6 metals, the % difference between the original and five-fold diluted results was ≤ 10%. As such, data qualification was not necessary. The serial dilution test for sample MMW-17A-T01N-GRWL was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 6 of the 24 metals. For each of these 6 metals, the % difference between the original and five-fold diluted results was ≤ 10%. As such, data qualification was not necessary. The serial dilution test was applicable (i.e., the metal concentration > 50xIDL adjusted for dilution) for sample MMW-47A-D01N-GRWL for only 8 of the 24 metals. Of these 8 metals, the percent difference for 2 exceeded the evaluation criteria of ≤ 10%. Table 1.5 summarizes these results and data qualification issued. The serial dilution test was applicable (i.e., the metal concentration > 50xIDL adjusted for dilution) for sample MMW-47A-T01N-GRWL for only 8 of the 24 metals. Of these 8 metals, the percent difference for 4 exceeded the evaluation criteria of ≤ 10%. Table 1.5 summarizes these results and data qualification issued. The serial dilution results for the December 2002 sampling event will be evaluated collectively and any additional data qualification issued will be summarized in the overall assessment. The selenium results for sample MW-9A-T01N/D01N-GRW were qualified as estimated (J/UJ TVP-I) because the dissolved selenium result was greater than the total selenium result. For samples MMW-17A-T01N-GRW, MMW-17B-T01N-GRW, and MMW-44A-T01D-GRW, the percent differences between the anion/cation balances were -27.09 (pH=4.56), -15.52 (pH=4.44), and –15.79 (pH=3.87) respectively, outside the acceptance range of ±13%. The sulfate results for samples MMW-17A-T01N/D01N-GRW and MMW-17B-T01N/D01N-GRW were reanalyzed in SDG WATRAA1, and resulting percent differences were 3.40 and –4.61, respectively. Since both of these reanalyze were with the 13% limit, no qualification was necessary in sample MMW-17A-T01N/D01N-GRW and MMW-17B-T01N/D01N-GRW. Sample MMW-44A-T01D/D01D-GRW was not reanalyzed, therefore due to the results relative to TDS, specific conductivity, and the sulfate concentration of the parent sample to which this is the field duplicate (2750 mg/kg vs. 3330 mg/kg) indicates that the sulfate results were likely biased high. Therefore the sulfate results for these samples were qualified as estimated (J). A qualification code of "TvP-I" was assigned.
Field QC Field Duplicate (FD) MMW-47A-T01D-GRW MMW-47A-D01D-GRW Rinsate Blank (RB) Field Blank (FB) Trip Blank (TB) TB30T-GRW TB78T-GRW TB80T-GRW Other (e.g., splits)	Yes	There were no detections in the field quality control blanks. The field quality control results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: VOCs/SVOCs: Initial and Continuing Calibration. The initial calibration for both the VOCs and the SVOCs were within limits, therefore no qualification was necessary. There were several continuing calibrations in the VOCs and the SVOCs that exceeded the criterion of a the percent difference <25%. Table 1.6 summarizes the continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issued. Explosives: Laboratory Control Sample. The percent recovery of the target compound PYX was less than the applied default range as noted in the case narrative discussion. Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite as N	Orthophosphate	TDS	Sulfate
MMW-47A-T01N-GRW	2.2 J	---	---	---	804 J
MMW-17B-T01N-GRW	0.41 J	0.005 UJ	0.011 J	---	---
MMW-44A-T01N-GRW	0.64 J	0.005 UJ	0.054 J	4280 J	---
MMW-44A-T01D-GRW	0.77 J	0.005 UJ	0.056 J	4670 J	---
MW-9A-T01N-GRW	0.68 J	0.005 UJ	0.017 J	---	---
MW-17-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ	---	---
MMW-19B-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ	---	---
MW-20-T01N-GRW	1.8 J	0.005 UJ	---	---	---

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS) DF=2 Except DF=10 for MMW-44A	0.7 0.7	0.6 0.6	0.6	0.7	0.8			0.30	MMW-17A-T01N-GRW,	U CCB-I
Boron (P) DF=1	2.9		3.9					2.7	MMW-17A-D01N-GRW, MMW-17A-T01N-GRW, MMW-17B-D01N-GRW, MMW-17B-T01N-GRW, MMW-19B-D01N-GRW, MMW-19B-T01N-GRW, MMW-44A-D01N-GRW, MMW-44A-T01N-GRW, MMW-44A-D01D-GRW, MMW-44A-T01D-GRW, MMW-47A-D01N-GRW, MMW-47A-T01N-GRW, MW-20-D01N-GRW	U CCB-I
Chromium (P) DF=1					3.9	12.8	3.927	3.7	MMW-47A-D01N-GRW, MW-17-T01N-GRW, MW-20-T01N-GRW, MW-9A-T01N-GRW	U MB-I U CCB-I
Potassium (P) DF=1			-272.1	-453.8	-286.8	-351.5		201.8	MMW-17A-D01N-GRW, MMW-17A-T01N-GRW, MMW-17B-D01N-GRW, MMW-17B-T01N-GRW, MW-17-D01N-GRW, MW-20-D01N-GRW, MW-20-T01N-GRW, MW-9A-D01N-GRW, MW-9A-T01N-GRW	J CCB-L
Manganese (P) DF=1				0.6	0.5	0.6		0.5	MW-9A-D01N-GRW	U CCB-I
Selenium (MS) DF=2		-0.4		-0.3	0.6			0.2	MMW-17A-D01N-GRW, MMW-17A-T01N-GRW, MMW-17B-D01N-GRW, MMW-17B-T01N-GRW, MMW-19B-D01N-GRW, MMW-19B-T01N-GRW, MMW-47A-D01N-GRW, MW-17-D01N-GRW, MW-17-T01N-GRW MW-20-D01N-GRW, MW-20-T01N-GRW, MW-9A-T01N-GRW	UJ CCB-L J CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Recovery Not Meeting Criteria

Sample/Analytes	Matrix Spike Recoveries	Matrix Spike Duplicate Recoveries	Acceptance Limits	Action
MMW-17A-T01N-GRW				
Bicarbonate Alkalinity	29.4%	NA	75-125%	Qualify parent sample J MS-L
Total Alkalinity	29.4%	NA		Qualify parent sample J MS-L
MMW-47A-T01N-GRW				
TKN	41.5%	NA	75-125%	Qualify parent sample UJ MS-L
Cyanide	11.5%	NA		Qualify parent sample J MS-L
4-Chloro-3-Methylphenol	105%	99%	23-97%	Recoveries exceeding the upper limit of the acceptance range but <125% are not considered to be indicative of unacceptable accuracy, no qualification required.
4-Nitrophenol	99%	95%	10-80%	
PETN	74%	NA	75-110%	Qualify parent sample UJ MS-L
PYX	16%	14%	70-130%	Qualify parent sample UJ MS-L

Matrix spike recoveries for sample concentrations that are greater than 4x the spike concentrations are considered to be inappropriate for assessing accuracy.
NA=the matrix spike duplicate was not analyzed for the inorganic and metal analytes.

Table 1.4
Duplicate Inorganic Qualifications

Sample/Analyte	Absolute difference	RL	Action
MMW-17A-T01N-GRW			
Bicarbonate Alkalinity	1.9	1.0	Qualify parent sample J D-I
Total Alkalinity	1.9		Qualify parent sample J D-I
MMW-47A-T01N-GRW			
Bicarbonate Alkalinity	1.3	1.0	Qualify parent sample J D-I
Total Alkalinity	1.3		Qualify parent sample J D-I

Table 1.5
Serial Dilution Qualifications

Sample Analyte	%Difference	Action
MMW-47A-T01N-GRW		
Manganese	11.9%	Qualify the parent sample J DL-H
Zinc	12.2%	

Table 1.6
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
12/10/02 (0714)	Acetone	-30.1%	MMW-44A-T01N-GRW, MMW-44A-T01D-GRW, MMW-47A-T01N-GRW, MW-17-T01N-GRW, TB30T-GRW, TB78T-GRW TB80T-GRW	J CCAL-I or UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
12/11/02 (1531)	Benzaldehyde Phenol 2,2'oxybis (1-chloropropane) 4-Nitrophenol	-31.6% -35.0% -53.1% 27.2%	MMW-44A-T01N-GRW, MMW-44A-T01D-GRW, MMW-47A-T01N-GRW, MW-17-T01N-GRW	J CCAL-I or UJ CCAL-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT029 Sampling Event: Fall 2002

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 12/15/02

Peer Reviewer: Stacey Coker Date Completed: 12/16/02

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
EW-5C-T01N-GRW	511806	SA	W	X	X						
EW-5C-D01N-GRW	511807	SA	W	X							

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (detailed above).

_____ Some or all data are unusable for any purpose (detailed above).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for full sample identifier.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour hold time for Nitrate as N, Nitrite as N, and Orthophosphate was not met for some samples. See Table 1.1 for sample qualifications. The bias direction for results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Antimony, copper, and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In all cases, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC MS/MSD/PDS LD	NA	Although there were no project-specific matrix QC samples in this package, the overall matrix QC frequency was met for the Fall 2002 sampling event. The results will be used to formulate the accuracy and precision sections of the overall assessment.
Method QC Surrogates Serial Dilution EW-5C-T01N-GRW Internal Standards Total vs. Partial Analyses Cation/Anion Balance	Yes	The serial dilution test for sample RR-6-D01N-SFWL was applicable (i.e., metal concentration >50xIDL adjusted for dilution) for only 3 of the 24 metals. For each of these 3 metals, the % difference between the original and five-fold diluted results was ≤ 10%. As such, data qualification was not necessary. The serial dilution results for the Fall 2002 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment.
Field QC Field Duplicate Rinsate Blank Field Blank Trip Blank Other (e.g., splits)	NA	This package did not include and field QC samples.
Nondetect Results w/ Elevated RLs?	Yes	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	NA	The review of additional parameters was not necessary.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	NA	Package reviewed for sample-specific parameters only.
Initial/Continuing Calibration Verification	NA	Package reviewed for sample-specific parameters only.
Laboratory Control Sample Results	NA	Package reviewed for sample-specific parameters only.
Compound Identification	NA	Package reviewed for sample-specific parameters only.
Quantification	NA	Package reviewed for sample-specific parameters only.
Verification	NA	Package reviewed for sample-specific parameters only.

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	NA	Package reviewed for sample-specific parameters only.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite as N	Orthophosphate
EW-5C-T01N-GRW	0.45 UJ	0.005 UJ	0.024 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	MB (µg/l)	RL[2]	Samples Qualified	Qualification Codes
Antimony (MS)	0.5	0.2		0.20	EW-5C-T01N-GRW, EW-5C-D01N-GRW	U CCB-I
Copper (MS)			1.649	0.30	EW-5C-T01N-GRW, EW-5C-D01N-GRW	U MB-I
Sodium (P)		642.3		539	NONE	Data qualification was not necessary, as all sodium results were sufficiently high that the suggested potential low bias is negligible.

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit
[2] The laboratory used the instrument detection limit as the RL.
Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT030 Sampling Event: December 2002

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 02/12/03

Peer Reviewer: Alan Roberts Date Completed: 07/18/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
MMW-42B-T01N-GRW	SA	511874		W	X	X					
MMW-42B-D01N-GRW	SA	511875		W	X						
TB22T-GRW	TB	512029		W			X				
TB86T-GRW	TB	512032		W			X				
MMW-48A-T01N-GRW	SA	512033	MW48AT01NGRW	W	X	X		X	X		
MMW-48A-D01N-GRW	SA	512034		W	X						
MMW-31B-T01N-GRW	SA	512035		W	X	X			X		
MMW-31B-D01N-GRW	SA	512036		W	X						
RB01T-GRW	RB	512037		W	X	X		X	X		
FB01T	FB	512038		W			X	X	X		
MW-1-T01N-GRW	SA	512213		W	X	X					
MW-1-D01N-GRW	SA	512214		W	X						
MW-1-T01D-GRW	SA	512215		W	X	X					
MW-1-D01D-GRW	SA	512216		W	X						
MW-24-T01N-GRW	SA	512217		W	X	X					
MW-24-D01N-GRW	SA	512218		W	X						
RB02T-GRW	RB	512219		W	X	X	X	X	X		
TB28T-GRW	TB	512220		W			X				

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The original ammonia analyses of samples MMW-48A-T01N-GRW, MMW-31B-T01N-GRW, and RB01T-GRW were performed within the prescribed holding time. However, these samples required reanalyses, which were performed 8 days outside the prescribed holding time. The results from these reanalyses have been formally presented in this sample delivery group (SDG). Table 1.1 below summarizes the qualification for holding time in ammonia.

A volatile organic holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank have been included in the SDG and is labeled HBW030.

Manual integration was employed in deriving results for the volatile and semi-volatile organic compound analyses in this SDG. The values that have been derived from manual integration are qualified on the quantitation reports and extracted ion current profiles are included in the SDG.

The semivolatile analysis of laboratory control samples E2LCSD, E6LCS, and E6LCSD yielded a slightly high percent recovery of the target compounds 4-Chloro-3-Methylphenol (E2LCSD=99%), 4-Nitrophenol (E2LCSD=88%, E6LCS=84%, E6LCSD=103%), and Pentachlorophenol (E6LCSD=111%). The CLP method does not require the blank spike to be analyzed for the semivolatile organic compounds; however, the laboratory did report these values along with their historical QC limits of 4-Chloro-3-Methylphenol (23-97%), 4-Nitrophenol (10-80%), and Pentachlorophenol (9-103%). The blank spike in this analytical set is generally actually at a higher or equivalent accuracy than the historical QC limits. Accuracy of 4-chloro-3-Methylphenol (99%), 4-Nitrophenol (88%, 84%, and 103%), and Pentachlorophenol (111%) are considered acceptable; therefore no qualifications are necessary.

The nitroaromatics analysis of blank spike samples D1LCS yielded a slightly low percent recovery (LCS=65%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time; therefore the laboratory applied the default range of 70-130%. Since the D1LCS recovery is less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were problems noted with sample receipt. Vials for sample MMW-48A-T01N-GRW were accidentally labeled for volatile organic compounds (VOCs). The laboratory was contacted and the correction was made so that the sample was not analyzed for VOCs. No qualification for the associated data was considered necessary. One of the vials for Total Organic Carbon spilled during pH testing. The laboratory confirmed that there was enough of the sample left for the analysis to be completed. No qualification for the associated data was considered necessary. The laboratory noted that sample MMW-42B-T01N-GRW for cyanide analysis was received at an improper pH, which may have resulted in possible loss of cyanide. The nondetect results were qualified as estimated (UJ). The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Holding Times	No	The 48-hour holding time was exceeded by less than 24 hours for nitrate as N, nitrite as N, orthophosphate and a 28-day hold time was exceeded by less than 7-days for Ammonia. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Antimony, boron, chromium, copper, iron, manganese, nickel, and bis (2-ethylhexl) phthalate were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL, if it was greater than the RL. An indeterminate bias direction was assigned. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKE4. TICs in method blanks are not considered to be reportable as TICs for samples and their identification as TICs was rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associated numerical value represented its approximate value.
Matrix QC MS/MSD/PDS LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the December 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution MMW-48A-T01N-GRWL Internal Standards Total vs. Partial Analyses Cation/Anion Balance	No	The surrogate recovery for the explosive analysis was low in sample FB01T. The recovery of 1,2-dinitrobenzene was 81%. This recovery is outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Because the surrogate recovery is lower than the acceptance limit but greater than 10%, all explosive results for sample FB01T were qualified as estimated (UJ). The serial dilution test was applicable (i.e., the metal concentration > 50xIDL adjusted for dilution) for sample MMW-48A-T01N-GRWL for only 10 of the 24 metals. Of these 10 metals, the percent difference for 1 exceeded the evaluation criteria of ≤ 10%. Table 1.3 summarizes these results and data qualification issued. The serial dilution results for the December 2002 sampling event will be evaluated collectively and any additional data qualification issued will be summarized in the overall assessment. For samples MW-24-T01N/D01N-GRW, and RB02T-GRW, the absolute values of the anion/cation balance percent difference were –25.62 and –15.81 respectively, outside of the acceptance range of ±13%. Sample MW-24-T01N/D01N-GRW had anions biased high, most likely due to the high level of bicarbonate alkalinity and sulfate in the sample. However, there was not enough established historical data to rule out the possible low bias in calcium and sodium as well. The sample was re-analyzed and the anion/cation balance was re-calculated with a percent difference of –19.05. Also, for the reanalysis the measured TDS was less than the calculated TDS which indicated that the sample results were likely biased high due the sulfate and bicarbonate alkalinity. Therefore, only the sulfate and the bicarbonate alkalinity were qualified as estimated (J). A qualification code of "TVP-H" was assigned. The TDS results for samples RB01T-GRW and RB02T-GRW were qualified ad unusable (R) on the basis of total versus partial analyses. The reported values were 1030 and 86 mg/L respectively. The calculated TDS resulting from the cation/anion balance calculation was 3 mg/L for both samples. As there were very few detections for these rinsate blank samples, the calculated TDS value was largely influenced by the reporting limits, as reporting limits were used in the ion balance calculation for nondetect values. The large disparity between the measured and calculated TDS values coupled with the minimal detections in the rinsate blank samples, indicate that the reported TDS results are inaccurate. As such, the TDS results for the rinsate blanks were qualified as unusable (R TVP-H). Result qualifications are summarized in Table 1.8.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC Field Duplicate (FD) MW-1-T01D-GRW MW-1-D01D-GRW Rinsate Blank (RB) RB01T-GRW RB02T-GRW Field Blank (FB) FB01T Trip Blank (TB) TB22T-GRW TB28T-GRW TB86T-GRW Other (e.g., splits)	No	There were a few detections in the various field quality control blanks (RB, FB, and TB). These are summarized in Tables 1.4, 1.5, and 1.6. The RB, FB, and TB results for the December 2002 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: VOCs/SVOCs: Initial and Continuing Calibration. The initial calibration for both the VOCs and the SVOCs were within limits, therefore no qualification was necessary. There were several continuing calibrations in the VOCs and the SVOCs that exceeded the percent difference criterion of 25%. Table 1.7 summarizes the continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issued. Explosives: Laboratory Control Sample. The percent recovery of the target compound PYX was less than the applied default range as noted in the case narrative summary section. Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Ammonia (mg/L)
MMW-42B-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ	---
MMW-48A-T01N-GRW	0.40 UJ	0.005 UJ	0.11 J	0.054 J
MMW-31B-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ	0.056 J
RB01T-GRW	0.40 UJ	0.005 UJ	0.010 UJ	0.027 J
MW-1-T01N-GRW	1.0 J	0.005 UJ	0.010 UJ	---
MW-1-T01D-GRW	1.0 J	0.005 UJ	0.010 J	---
MW-24-T01N-GRW	0.40 UJ	0.023 J	0.010 UJ	---
RB02T-GRW	0.40 UJ	0.005 UJ	0.14 J	---

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Boron (P) DF=1	2.9					2.7	MMW-31B-D01N-GRW, MMW-31B-T01N-GRW, MMW-48A-D01N-GRW, MW-24-T01N-GRW	U CCB-I
Chromium (P) DF=1	-2.7	-2.9	-2.4			1.6	MMW-31B-D01N-GRW, MMW-31B-T01N-GRW, MMW-42B-D01N-GRW, MMW-42B-T01N-GRW, MMW-48A-D01N-GRW, MMW-48A-T01N-GRW, MW-1-D01N-GRW, MW-1-D01D-GRW, MW-1-T01N-GRW, MW-1-T01D-GRW, MW-24-D01N-GRW, MW-24-T01N-GRW, RB01T-GRW, RB02T-GRW	UJ CCB-L J CCB-L
Copper (MS) DF=2					1.023	0.30	MMW-42B-D01N-GRW, MMW-42B-T01N-GRW, MW-1-D01D-GRW, MW-1-T01D-GRW, MW-1-T01N-GRW, MW-24-T01N-GRW	U MB-I
Iron (P) DF=1	33.6	29.0	43.8	38.0		26.6	MW-1-D01N-GRW, MW-1-D01D-GRW	U CCB-I
Manganese (P) DF=1 except MMW-35B DF=10	-0.5			-0.5 0.5		0.5	RB01T-GRW, RB02T-GRW	UJ CCB-L

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	RL	Samples qualified	Qualification code
bis (2-Ethylhexyl) phthalate					1	10	MMW-48A-T01N-GRW, RB01T-GRW, RB02T-GRW	U MB-I

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Qualifications

Sample Analyte	%Difference	Action
MMW-48A-T01N-GRW Copper	27.1%	The parent sample was qualified (J/UJ) for these analytes. Also, any additional qualification will be assigned after evaluating results collectively. Any resultant data qualification will be summarized in the overall assessment for the December 2002 sampling event.

Table 1.4
Positive Results for Rinsate Blanks

Analyte	RB01T-GRW	RB02T-GRW
TDS (mg/L)	1030	86
TSS (mg/L)	1.2	1.9
Bicarbonate Alkalinity (mg/L)	1.1	1.2
Total Alkalinity (mg/L)	1.1	1.2
Ammonia (mg/L)	0.027	---
Orthophosphate (mg/L)	---	0.14
Phosphorus (mg/L)	0.010	---
Aluminum (µg/l)	---	13.8
Copper (µg/l)	---	18.8
Calcium (µg/l)	163	---
Manganese (µg/l)	2.2	---
Zinc (µg/l)	15.4	5.1
1,1,2-Trichloro-1,2,2-trifluoroethene (µg/l)	---	1
Acetone (µg/l)	---	3
Chloroform (µg/l)	---	8
Bis (2-ethylhexyl) phthalate (µg/l)	0.5	0.8

Table 1.5
Positive Results for Field Blank

Analyte	FB01T
Chloroform (µg/l)	8
bis (2-ethylhexyl) phthalate (µg/l)	14

Table 1.6
Positive Results for Trip Blanks

Analyte	TB22T-GRW
Acetone (µg/l)	2

Table 1.7
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
12/10/02 (0714)	Acetone	-30.1%	FB01T, MW-48A-T01N-GRW, RB02T-GRW, TB22T-GRW, TB28T-GRW, TB86T-GRW	J CCAL-I or UJ CCAL-I
12/16/02 (1709)	Acetone	-25.5%		
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
12/12/02 (0324)	Benzaldehyde Phenol 2,2'oxybis (1-chloropropane) Hexachlorocyclopentadiene 4-Nitrophenol	33.7% -28.5% -44.8% 26.2% 33.0%	FB01T, MW-48A-T01N-GRW, RB01T-GRW, RB02T-GRW	J CCAL-I or UJ CCAL-I

Table 1.8
Total Versus Partial Qualifications

Sample	Result mg/L	Qualification and Qualification Codes
RB01T-GRW	1030	R TVP-H
RB02T-GRW	86	R TVP-H

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WATRAA1 Sampling Event: Fall 2002 Reanalysis

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 04/11/03

Peer Reviewer: Alan Roberts Date Completed: 04/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses			
					Hardness	Fluoride	Sulfate	Metal
SPRING13-D01N-GRWRE	SA	517694		W	X		X	X
CAPULIN SPRING-D01N-GRWRE	SA	517695	CAPULINSPG-D01N-GRWRE	W	X		X	X
CAPULIN1-D01N-GRWRE	SA	517696		W	X		X	X
LOWER SPRING 13-D01N-GRWRE	SA	517697	LOWERSPG 13-D01N-GRWRE	W	X	X	X	X
MMW-17B-D01N-GRWREQ	SA	517698		W	X		X	X
MMW-23A-D01N-GRWRE	SA	517699		W	X		X	X
MMW-36B-D01N-GRWRE	SA	517700		W	X		X	X
MMW-19A-D01N-GRWRE	SA	517701		W	X		X	X
MMW-19A-D01D-GRWRE	FD	517702		W	X	X	X	X
MMW-31A-D01N-GRWRE	SA	517703		W	X			X
MMW-31A-D01D-GRWRE	FD	517704		W	X			X
MMW-24-D01N-GRWRE	SA	517705		W	X			X
MMW-32A-D01N-GRWRE	SA	517706		W	X			X
P-3-D01N-GRWRE	SA	517707		W	X			X
MMW-11A-D01N-GRWRE	SA	517708		W	X			X
MMW-11A-D01D-GRWRE	FD	517709		W	X			X
MMW-10A-D01N-GRWRE	SA	517710		W	X			X
MMW-17A-D01N-GRWREQ	SA	517711		W	X			X
P-2-D01N-GRWRE	SA	517712			X			X
MMW-21-D01N-GRWRE	SA	517713			X			X
MMW-7-D01N-GRWRE	SA	517714			X			X
MMW-28B-D01N-GRWRE	SA	517715			X			X
MMW-7-D01D-GRWRE	FD	517716			X			X
MMW-22-D01N-GRWRE	SA	517717			X			X
P-1-D01N-GRWRE	SA	517718			X			X
MMW-33A-D01N-GRWRE	SA	517719			X			X
P-5B-D01N-GRWRE	SA	517720			X			X

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses			
					Hardness	Fluoride	Sulfate	Metal
P-5C-D01N-GRWRE	SA	517721			X			X
MMW-2-D01N-GRWRE	SA	517722			X			X
COLUMBINE WELL NO 1-D01N-GRWRE	SA	517723	COLWELLNO1-D01N-GRWRE		X			X
COLUMBINE2-D01N-GRWRE	SA	517724			X			X
SPRING14-D01N-GRWRE	SA	517725			X			X
DOUGLAS-D01D-GRWRE	FD	517726			X			X
P-4B-D01N-GRWRE	SA	517727			X			X
MMW-42A-D01N-GRWRE	SA	517728			X			X
MMW-44A-D01N-GRWRE	SA	517729			X			X
MMW-38A-D01N-GRWRE	SA	517730			X			X
MMW-17A-D01N-GRWREM	SA	517731	MMW-17A-D01N-GRWRE		X			X
MMW-17B-D01N-GRWREM	SA	517732	MMW-17B-D01N-GRWRE		X			X
DOUGLAS-D01N-GRWRE	SA	517733			X			X
SPRING 13-T01N-GRWRE	SA	517734				X	X	
CAPULIN SPRING-T01N-GRWRE	SA	517735	CAPULINSPG-T01N-GRWRE			X	X	
CAPULIN1-T01N-GRWRE	SA	517736				X	X	
LOWER SPRING 13-T01N-GRWRE	SA	517737	LOWERSPPG13-T01N-GRWRE			X	X	
MMW-17B-T01N-GRWREQ	SA	517738	MMW-17B-T01N-GRWRE				X	
MMW-23A-T01N-GRWRE	SA	517739				X	X	
MMW-36B-T01N-GRWRE	SA	517740				X	X	
MMW-19A-T01N-GRWRE	SA	517741				X	X	
MMW-19A-T01D-GRWRE	SA	517742				X	X	
MMW-31A-T01N-GRWRE	SA	517743				X	X	
MMW-31A-T01D-GRWRE	SA	517744				X	X	
MMW-24-T01N-GRWRE	SA	517745				X	X	
MMW-32A-T01N-GRWRE	SA	517746				X	X	
P-3-T01N-GRWRE	SA	517747				X	X	
MMW-11A-T01N-GRWRE	SA	517748				X	X	
MMW-11A-T01D-GRWRE	FD	517749				X	X	
MMW-10A-T01N-GRWRE	SA	517750				X	X	
MMW-17A-T01N-GRWREQ	SA	517751	MMW-17A-T01N-GRWRE				X	
P-2-T01N-GRWRE	SA	517752				X	X	
MMW-21-T01N-GRWRE	SA	517753				X	X	
MMW-7-T01N-GRWRE	SA	517754				X	X	
MMW-28B-T01N-GRWRE	SA	517755				X	X	
MMW-7-T01D-GRWRE	FD	517756				X	X	
MMW-22-T01N-GRWRE	SA	517757				X	X	
P-1-T01N-GRWRE	SA	517758				X	X	
MMW-33A-T01N-GRWRE	SA	517759				X	X	
P-5B-T01N-GRWRE	SA	517760				X	X	
P-5C-T01N-GRWRE	SA	517761				X	X	
MMW-2-T01N-GRWRE	SA	517762				X	X	

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses			
					Hardness	Fluoride	Sulfate	Metal
COLUMBINE WELL NO 1-T01N-GRWRE	SA	517763	COLWELLNO1-T01N-GRWRE			X	X	
COLUMBINE2-T01N-GRWRE	SA	517764				X	X	
SPRING14-T01N-GRWRE	SA	517765				X	X	
DOUGLAS-T01D-GRWRE	FD	517766				X	X	
P-4B-T01N-GRWRE	SA	517767				X	X	
MMW-42A-T01N-GRWRE	SA	517768				X	X	
MMW-44A-T01N-GRWRE	SA	517769				X	X	
MMW-38A-T01N-GRWRE	SA	517770				X	X	
MMW-17A-T01N-GRWREM	SA	517771	MMW-17A-T01N-GRWRE				X	
MMW-17B-T01N-GRWREM	SA	517772	MMW-17B-T01N-GRWRE				X	
DOUGLAS-T01N-GRWRE	SA	517773				X	X	

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

These analytical results in this package are the re-analyses of sulfate, fluoride, and metals performed for groundwater samples collected in the fall 2002 as well as groundwater samples collected in December 2002.

In instances where samples from the same location were collected in both the monthly and quarterly sampling events, a suffix was added to the field ID to differentiate the samples. “M” was added for the monthly samples. “Q” was added for the quarterly samples. Additionally, the “RE” suffix was added for all samples to represent re-analyses.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	No	The 28-day holding time for sulfate and fluoride were exceeded due to the samples being re-analyzed by a modified method to reduce matrix interferences present in the original analyses. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, arsenic, boron, chromium, copper, iron, manganese, molybdenum, and potassium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC MS/MSD/PDS MMW-17B-T01N-GRWREQ MMW-31A-T01N-GRWRE MMW-32A-T01N-GRWRE MMW-17A-T01N-GRWREQ P-2-T01N-GRWRE MMW-17A-T01N-GRWREM LD MMW-17B-D01N-GRWREQ MMW-31A-D01N-GRWRE MMW-32A-D01N-GRWRE MMW-17A-D01N-GRWREQ P-2-D01N-GRWRE MMW-17A-D01N-GRWREM MMW-17B-T01N-GRWRE MMW-31A-T01N-GRWRE MMW-32A-T01N-GRWRE MMW-17A-T01N-GRWREQ P-2-T01N-GRWRE MMW-17A-T01N-GRWREM	No	The matrix spike percent recovery was out of limits in samples MMW-17A-T01N-GRWREQ, MMW-17A-D01N-GRWREM, MMW-17A-D01N-GRWREQ, MMW-17B-T01N-GRWREQ, MMW-17B-D01N-GRWREQ, MMW-31A-D01N-GRWRE, MMW-32A-D01N-GRWRE, and P-2-D01N-GRWRE. Table 1.3 summarizes these matrix spike results. Parent samples were qualified on the basis of MS results per SOP 12.1. Samples MMW-17B-D01N-GRWREQ, MMW-31A-D01N-GRWRE, MMW-32A-D01N-GRWRE, MMW-17A-D01N-GRWREQ, P-2-D01N-GRWRE, and MMW-17A-D01N-GRWRE had inappropriate spike levels for one or all cadmium, chromium, iron, or selenium analyses. The dilutions of 10x (selenium) or 100x (cadmium, chromium, or iron) in these six samples caused spike concentration to fall below the reporting limit. The matrix spike results for each sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The post digestion spike recovery was out of limits in samples MMW-17A-D01N-GRWRE, MMW-31A-D01N-GRWRE, MMW-32A-D01N-GRWRE, and P-2-D01N-GRWRE. Table 1.4 summarizes these post digestion spike results. The post digestion spike results for each sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent samples were qualified on the basis of MS results per SOP 12.1
Method QC Surrogates Serial Dilution Internal Standards Total vs. Partial Analyses Cation/Anion Balance	Yes	The serial dilution analyses were conducted on samples MMW-17B-D01N-GRWREQ, MMW-31A-D01N-GRWRE, MMW-32A-D01N-GRWRE, MMW-17A-D01N-GRWQ, P-2-D01N-GRWRE, and MMW-17A-D01N-GRWREM. For samples MMW-31A-D01N-GRWRE, MMW-32A-D01N-GRWRE, and P-2-D01N-GRWRE the percent difference between the original result and result for the diluted sample for one analyte in 3 samples did not satisfy the ≤10% criterion. Table 1.5 summarizes these results and the resultant data qualifications. The serial dilution results for each sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples CAPULINSPG-D01N-GRWRE, CAPULIN1-D01N-GRWRE, MMW-23A-D01N-GRWRE, MMW-19A-D01N-GRWRE, MMW-19A-D01D-GRWRE, MMW-31A-D01N-GRWRE, MMW-31A-D01D-GRWRE, MMW-32A-D01N-GRWRE, P-3-D01N-GRWRE, MMW-11A-D01N-GRWRE, MMW-7-D01N-GRWRE, MMW-7-D01D-GRWRE, MMW-22-D01N-GRWRE, P-1-D01N-GRWRE, P-5C-D01N-GRWRE, MMW-44A-D01N-GRWRE, and MMW-38A-D01N-GRWRE. Similarly, the internal standard Tb was high for the IPCMS analysis of samples CAPULINSPG-D01N-GRWRE, CAPULIN1-D01N-GRWRE, MMW-23A-D01N-GRWRE, and MMW-38A-D01N-GRWRE. Data qualification was not necessary for either internal standard as none of the ICPMS analytes reported were quantitated using this standard.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		For samples MMW-17B-T01N-D01N-GRWREM, COLWELLNO1-T01N/D01N-GRWRE, and MMW-26B-T01N-/D01N-GRWRE the anion/cation were 17.9%, 16.1%, and 13.5% respectively, outside the acceptance range of ±13%. For these samples, the contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these samples results were considered necessary for charge balance.
Field QC Field Duplicate MMW-19A-D01D-GRWRE MMW-31A-D01D-GRWRE MMW-11A-D01D-GRWRE MMW-7-D01D-GRWRE DOUGLAS-D01D-GRWRE Rinsate Blank Field Blank Trip Blank Other (e.g., splits)	Yes	
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. These reanalyses followed this dilution scheme. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	NA	Package reviewed for sample-specific parameters only.
Initial/Continuing Calibration Verification	NA	Package reviewed for sample-specific parameters only.
Laboratory Control Sample Results	NA	Package reviewed for sample-specific parameters only.
Compound Identification	NA	Package reviewed for sample-specific parameters only.
Quantification	NA	Package reviewed for sample-specific parameters only.
Verification	NA	Package reviewed for sample-specific parameters only.
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	NA	Package reviewed for sample-specific parameters only.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Sulfate (mg/L)	Fluoride (mg/L)
SPRING13-T01N-GRWRE	966 J	9.6 J
CAPULINSPRG-T01N-GRWRE	11600 J	92.4 J
CAPULIN1-T01N-GRWRE	4360 J	38.5 J
LOWERSPG13-T01N-GRWRE	1540 J	14.4 J
MMW-17B-T01N-GRWREQ	631 J	---
MMW-23A-T01N-GRWRE	2240 J	55.5 J
MMW-36B-T01N-GRWRE	3050 J	34.8 J
MMW-19A-T01N-GRWRE	1740 J	32.9 J
MMW-19A-T01D-GRWRE	1690 J	33.7 J
MMW-31A-T01N-GRWRE	1630 J	33.4 J
MMW-31A-T01D-GRWRE	1690 J	35.2 J
MMW-24-T01N-GRWRE	1810 J	39.9 J
MMW-32A-T01N-GRWRE	1460 J	30.0 J
P-3-T01N-GRWRE	791 J	17.8 J
MMW-11A-T01N-GRWRE	1430 J	34.5 J
MMW-11A-T01D-GRWRE	1570 J	34.5 J
MMW-10A-T01N-GRWRE	1360 J	22.7 J
MMW-17A-T01N-GRWREQ	355 J	---
P-2-T01N-GRWRE	819 J	18.0 J
MMW-21-T01N-GRWRE	2510 J	23.3 J
MMW-7-T01N-GRWRE	5860 J	124 J
MMW-28B-T01N-GRWRE	434 J	2.2 J
MMW-7-T01D-GRWRE	6180 J	122 J
MMW-22-T01N-GRWRE	2660 J	32.5 J
P-1-T01N-GRWRE	1010 J	22.7 J
MMW-33A-T01N-GRWRE	1190 J	24.0 J
P-5B-T01N-GRWRE	1130 J	21.4 J
P-5C-T01N-GRWRE	1190 J	26.7 J
MMW-2-T01N-GRWRE	1440 J	10.6 J
COLWELLNO1-T01N-GRWRE	786 J	17.2 J
COLUMBINE2-T01N-GRWRE	631 J	11.2 J
SPRING14-T01N-GRWRE	279 J	2.8 J
DOUGLAS-T01D-GRWRE	677 J	14.1 J
P-4B-T01N-GRWRE	1170 J	23.4 J
MMW-42A-T01N-GRWRE	1350 J	21.8 J
MMW-44A-T01N-GRWRE	2660 J	24.5 J
MMW-38A-T01N-GRWRE	6400 J	82.4 J
MMW-17A-T01N-GRWREM	379 J	---
MMW-17B-T01N-GRWREM	361 J	---
DOUGLAS-T01N-GRWRE	649 J	14.3 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P) DF=100	31 45.4		 16.8	 17.2				14.2	DOUGLAS-D01N-GRWRE, DOUGLAS-D01D-GRWRE, LOWERSPG-13-D01N-GRWRE, MMW-17A-D01N-GRWREM, MMW-17A-D01N-GRWREQ, MMW-17B-D01N-GRWREM, MMW-17B-D01N-GRWREQ, MMW-28B-D01N-GRWRE, MMW-2-D01N-GRWRE, SPRING13-D01N-GRWRE, SPRING14-D01N-GRWRE	U CCB-I
Antimony (P) DF=2							3.6	2.8	MMW-22-D01N-GRWRE, MMW-7-D01N-GRWRE, MMW-7-D01D-GRWRE	U MB-I
Arsenic (P) DF=10		 2.8		3.2				2.3	CAPULIN1-D01N-GRWRE, CAPULINSPRG-D01N-GRWRE, MMW-10A-D01N-GRWRE, MMW-11A-D01N-GRWRE, MMW-19A-D01N-GRWRE, MMW-31A-D01D-GRWRE, MMW-32A-D01N-GRWRE, MMW-42A-D01N-GRWRE, MMW-7-D01N-GRWRE, P-2-D01N-GRWRE, SPRING14-D01N-GRWRE	U CCB-I
Boron (P) DF=1	7.6 5.5 4.7	4.9 4.7	4.5 7.3	 3.3	3.8	5.6	4.8	2.7	MMW-17A-D01N-GRWREM, MMW-31A-D01D-GRWRE, SPRING13-D01N-GRWRE	U CCB-I U MB-I
Chromium (P) DF=100	-3.7	-3.9	-4.0					3.7	CAPULIN1-D01N-GRWRE, CAPULINSPRG-D01N-GRWRE, COLUMBINE2-D01N-GRWRE, COLWELLNO1-D01N-GRWRE, DOUGLAS-D01N-GRWRE, DOUGLAS-D01D-GRWRE, LOWERSPG13-D01N-GRWRE, MMW-10A-D01N-GRWRE, MMW-11A-D01N-GRWRE, MMW-11A-D01D-GRWRE, MMW-17A-D01N-GRWREM, MMW-17A-D01N-GRWREQ, MMW-17B-D01N-GRWREM, MMW-17B-D01N-GRWREQ, MMW-19A-D01N-GRWRE, MMW-19A-D01D-GRWRE, MMW-21-D01N-GRWRE, MMW-22-D01N-GRWRE, MMW-23A-D01N-GRWRE, MMW-24-D01N-GRWRE,	UJ CCB-L J CCB-L
Chromium (P)	-3.7	-3.9	-4.0					3.7	MMW-28B-D01N-GRWRE, MMW-2-D01N-GRWRE,	

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
DF=100									MMW-31A-D01N-GRWRE, MMW-31A-D01D-GRWRE, MMW-32A-D01N-GRWRE, MMW-33A-D01N-GRWRE, MMW-36B-D01N-GRWRE, MMW-38A-D01N-GRWRE, MMW-42A-D01N-GRWRE, MMW-44A-D01N-GRWRE, MMW-7-D01N-GRWRE, MMW-7-D01D-GRWRE, P-1-D01N-GRWRE, P-2-D01N-GRWRE, P-3-D01N-GRWRE, P-4B-D01N-GRWRE, P-5B-D01N-GRWRE, P-5C-D01N-GRWRE, SPRING13-D01N-GRWRE, SPRING14-D01N-GRWRE	UJ CCB-L J CCB-L
Copper (P) DF=100							4.3	1.7	CAPULIN1-D01N-GRWRE, COLWELLNO1-D01N-GRWRE, DOUGLAS-D01N-GRWRE, DOUGLAS-D01D-GRWRE, LOWERSPG13-D01N-GRWRE, MMW-10A-D01N-GRWRE, MMW-11A-D01N-GRWRE, MMW-11A-D01D-GRWRE, MMW-19A-D01N-GRWRE, MMW-19A-D01D-GRWRE, MMW-21-D01N-GRWRE, MMW-22-D01N-GRWRE, MMW-24-D01N-GRWRE, MMW-31A-D01N-GRWRE, MMW-31A-D01D-GRWRE, MMW-32A-D01N-GRWRE, MMW-33A-D01N-GRWRE, MMW-7-D01N-GRWRE, MMW-7-D01D-GRWRE, P-1-D01N-GRWRE, P-2-D01N-GRWRE, P-3-D01N-GRWRE, P-4B-D01N-GRWRE, P-5B-D01N-GRWRE, P-5C-D01N-GRWRE, SPRING13-D01N-GRWRE, SPRING14-D01N-GRWRE	U MB-I
Iron (P) DF=100	28.2			27.9 32.5				48.9	DOUGLAS-D01N-GRWRE, DOUGLAS-D01D-GRWRE, MMW-21-D01N-GRWRE, MMW-23A-D01N-GRWRE, MMW-24-D01N-GRWRE, MMW-38A-D01N-GRWRE, SPRING13-D01N-GRWRE	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Manganese (P) DF=100							0.7	0.5	NONE	Data qualification was not necessary, as all manganese results were sufficiently higher than 5x the blank concentration.
Molybdenum (P) DF=10			1.4 1.5				1.7	1.1	SPRING13-D01N-GRWRE	U CCB-I U MB-I
Potassium (P) DF=100					-267.3			201.8	CAPULIN1-D01N-GRWRE, CAPULINSPRG-D01N-GRWRE, COLUMBINE2-D01N-GRWRE, COLWELLNO1-D01N-GRWRE, DOUGLAS-D01N-GRWRE, DOUGLAS-D01D-GRWRE, LOWERSPG13-D01N-GRWRE, MMW-10A-D01N-GRWRE, MMW-11A-D01N-GRWRE, MMW-11A-D01D-GRWRE, MMW-17A-D01N-GRWREM, MMW-17A-D01N-GRWREQ, MMW-17B-D01N-GRWREM, MMW-17B-D01N-GRWREQ, MMW-19A-D01N-GRWRE, MMW-19A-D01D-GRWRE, MMW-21-D01N-GRWRE, MMW-22-D01N-GRWRE, MMW-23A-D01N-GRWRE, MMW-24-D01N-GRWRE, MMW-28B-D01N-GRWRE, MMW-2-D01N-GRWRE, MMW-31A-D01N-GRWRE, MMW-31A-D01D-GRWRE, MMW-32A-D01N-GRWRE, MMW-33A-D01N-GRWRE, MMW-36B-D01N-GRWRE, MMW-38A-D01N-GRWRE, MMW-42A-D01N-GRWRE, MMW-44A-D01N-GRWRE, MMW-7-D01N-GRWRE, MMW-7-D01D-GRWRE, P-1-D01N-GRWRE, P-2-D01N-GRWRE, P-3-D01N-GRWRE, P-4B-D01N-GRWRE, P-5B-D01N-GRWRE, P-5C-D01N-GRWRE, SPRING13-D01N-GRWRE, SPRING14-D01N-GRWRE	UJ CCB-L

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Recovery Not Meeting Criteria for Sulfate and Metals

Sample/Analytes	Matrix Spike Recovery	Acceptance Limits
MMW-17A-D01N-GRWREQ		75-125%
Nickel	73.5%	
MMW-17A-D01N-GRWREM		
Cadmium	182.3%	
Cobalt	130.6%	
Copper	140.5%	
MMW-17B-D01N-GRWREQ		
Arsenic	140.5%	
Managanese	66.6%	
Nickel	71.4%	
MMW-17A-T01N-GRWREQ		
Sulfate	19.4%	
MMW-17B-T01N-GRWREQ		
Sulfate	67.9%	
MMW-31A-D01N-GRWRE		
Arsenic	171.8%	
Cadmium	171.5%	
Selenium	170.5%	
MMW-32A-D01N-GRWRE		
Arsenic	127.9%	
Cadmium	185.5%	
Copper	66.7%	
Selenium	73.6%	
P-2-D01N-GRWRE		
Arsenic	67.5%	
Cadmium	176.8%	
Nickel	164.4%	

Table 1.4
Post Digestion Spike Recovery Not Meeting Criteria

Sample/Analytes	PDS Recovery	Acceptance Limits
MMW-17A-D01N-GRWREQ		75-125%
Selenium	55.8%	
MMW-31A-D01N-GRWREQ		
Selenium	184.7%	
MMW-32A-D01N-GRWRE		
Selenium	66.1%	
P-2-D01N-GRWRE		
Selenium	139.1%	

Table 1.5
Serial Dilution Results Not Meeting Criteria

Sample/Analyte	%Difference
MMW-17B-D01N-GRW Mn	26.9%
MMW-32A-D01N-GRW Mn	10.6%
P-2-D01N-GRWRE Mn	49.0%

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WATRAF1 Sampling Event: Fall 2002 Reanalysis

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 04/09/03

Peer Reviewer: Alan Roberts Date Completed: 04/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses
					Fluoride
GOATHILLSPRING-T01N-GRWRE	SA	519250	GOATHILSPG-T01N-GRW	W	X
MMW-10C-T01N-GRWRE	SA	519251		W	X
MMW-11-T01N-GRWRE	SA	519252		W	X
MMW-17A-T01N-GRWREQ	SA	519253	MMW-17A-T01N-GRWRE	W	X
MMW-17A-T01N-GRWREM	SA	519254	MMW-17A-T01N-GRWRE	W	X
MMW-17B-T01N-GRWREQ	SA	519255	MMW-17B-T01N-GRWRE	W	X
MMW-17B-T01N-GRWREM	SA	519256	MMW-17B-T01N-GRWRE	W	X
MMW-25B-T01N-GRWRE	SA	519257		W	X
MMW-29A-T01N-GRWRE	SA	519258		W	X
MMW-19B-T01N-GRWRE	SA	519259		W	X
MMW-30A-T01N-GRWRE	SA	519260		W	X
MMW-31B-T01N-GRWREQ	SA	519261	MMW-31B-T01N-GRWRE	W	X
MMW-31B-T01N-GRWREM	SA	519262	MMW-31B-T01N-GRWRE	W	X
MMW-34B-T01N-GRWRE	SA	519263		W	X
MMW-39A-T01N-GRWRE	SA	519264		W	X
MMW-40A-T01N-GRWRE	SA	519265		W	X
MMW-47A-T01N-GRWRE	SA	519266		W	X
MMW-48A-T01N-GRWREQ	SA	519267	MMW-48A-T01N-GRWRE	W	X
MMW-48A-T01N-GRWREM	SA	519268	MMW-48A-T01N-GRWRE	W	X
MMW-8B-T01N-GRWRE	SA	519269		W	X
MMW-8B-T01D-GRWRE	FD	519270		W	X
SPRING39-T01N-GRWRE	SA	519271		W	X

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

These analytical results in this package are the re-analyses of Fluoride performed for groundwater samples collected in the fall 2002 as well as the groundwater samples collected in December 2002.

In instances where samples from the same location were collected in both the monthly and quarterly sampling events, a suffix was added to the field ID to differentiate the samples. "M" was added for the monthly samples. "Q" was added for the quarterly samples. Additionally, the "RE" suffix was added for all samples to represent re-analyses.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	NA	
Holding Times	No	The 28-day holding time for Fluoride was exceeded due to the samples being re-analyzed by a modified method to reduce matrix interferences present in the original analyses. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	Yes	
Matrix QC MS/MSD/PDS LD	Yes	
Method QC Surrogates Serial Dilution Internal Standards Total vs. Partial Analyses Cation/Anion Balance	NA	
Field QC Field Duplicate Rinsate Blank Field Blank Trip Blank Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	NA	Package reviewed for sample-specific parameters only.
Initial/Continuing Calibration Verification	NA	Package reviewed for sample-specific parameters only.
Laboratory Control Sample Results	NA	Package reviewed for sample-specific parameters only.
Compound Identification	NA	Package reviewed for sample-specific parameters only.
Quantification	NA	Package reviewed for sample-specific parameters only.
Verification	NA	Package reviewed for sample-specific parameters only.
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	NA	Package reviewed for sample-specific parameters only.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Fluoride (mg/L)
GOATHILLSPRING-T01N-GRWRE	102 J
MMW-10C-T01N-GRWRE	13.4 J
MMW-11-T01N-GRWRE	8.1 J
MMW-17A-T01N-GRWREQ	1.7 J
MMW-17A-T01N-GRWREM	1.7 J
MMW-17B-T01N-GRWREQ	1.6 J
MMW-17B-T01N-GRWREM	1.7 J
MMW-25B-T01N-GRWRE	1.7 J
MMW-29A-T01N-GRWRE	40.0 J
MMW-19B-T01N-GRWRE	3.2 J
MMW-30A-T01N-GRWRE	28.9 J
MMW-31B-T01N-GRWREQ	14.3 J
MMW-31B-T01N-GRWREM	15.7 J
MMW-34B-T01N-GRWRE	129 J
MMW-39A-T01N-GRWRE	150 J
MMW-40A-T01N-GRWRE	1.9 J
MMW-47A-T01N-GRWRE	17.2 J
MMW-48A-T01N-GRWREQ	32.5 J
MMW-48A-T01N-GRWREM	33.1 J
MMW-8B-T01N-GRWRE	1.8 J
MMW-8B-T01D-GRWRE	1.9 J
SPRING39-T01N-GRWRE	6.2 J

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE JANUARY 2003 SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

January 2003 with August 2006 Revision

URS

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Summary of Reanalyses Due to Matrix Related Analyses Issues 2-1

Section 3 Data Review Process 3-1

Section 4 Data Review Commentary 4-1

4.1 Data Review Narratives 4-1
4.2 General Data Quality Issues 4-1
4.2.1 Holding Blanks 4-1
4.2.2 Manual Integration 4-1
4.2.3 Low-Level Detections 4-1
4.2.4 TICS Reported In Blanks 4-1
4.2.5 Dilution Schemes/Non-Detects With Elevated Rls 4-2
4.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses: 4-2
4.2.7 Non-Valid Matrix Spikes 4-2
4.2.8 Laboratory Performance Review (LPR) Findings 4-2

Section 5 Collective Summary/Assessment of Matrix QC Results 5-1

5.1 Matrix Spike Results (Accuracy Evaluation) 5-1
5.1.1 Groundwater Matrix Spike 5-2
5.1.2 Surface Water Matrix Spike 5-4
5.2 Spike Duplicate Results and Laboratory Duplicates (Precision Evaluation) 5-4
5.2.1 Organic Analyses (MS/MSD Relative Percent Difference (RPD)) 5-5
5.2.2 Metals and Inorganic Laboratory Duplicates 5-5
5.3 Serial Dilution Results 5-5
5.3.1 Groundwater Serial Dilutions 5-5
5.3.2 Surface Water Serial Dilutions 5-6

Section 6 Collective Summary/Assessment of Field QC Results 6-1

6.1 Field Duplicate Samples 6-1
6.1.1 Groundwater Field Duplicate Results 6-2
6.1.2 Surface Water Field Duplicates Results 6-4
6.2 Rinsate Blank Results 6-4
6.2.1 Groundwater Rinsate Blanks 6-4
6.2.2 Surface Water Rinsate Blanks 6-7
6.3 Field Blank Results 6-7

TABLE OF CONTENTS

Section 7 Overall Data Quality Indicator Assessment 7-1

7.1 Precision 7-1
7.2 Accuracy 7-1
7.3 Completeness 7-1
7.4 Representativeness 7-1
7.5 Comparability 7-2
7.6 Sensitivity 7-2

List of Tables

Table 1-1 Summary of Groundwater Samples Collected During January 2003

Table 1-2 Field Identification of Surface Water Samples Collected During Fall 2002

Table 2-1 Re-analyses Summary for Water Samples Collected During January 2003

Table 5-1 Field Samples Submitted for Matrix Spike/Matrix Spike Duplicates

Table 5-2 Count of Matrix Spike Samples Collected in January 2003

Table 5-3 Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualifications for Groundwater Samples

Table 5-4 Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Table 5-5 Serial Dilution Outliers and Corresponding Results Qualification for Groundwater Samples

Table 6-1 Water Samples Submitted for Field Duplicates Analyses

Table 6-2 Field Duplicate Collection Frequency for the January 2003 Sampling Event

Table 6-3 Groundwater Field Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Table 6-4 Rinsate Blanks Collected During the January 2003 Sampling Event

Table 6-5 Groundwater Rinsate Blank Outliers and Corresponding Results Qualification for Samples Collected During January 2003

Table 6-6 Surface Water Rinsate Blank Outliers and Corresponding Results Qualification for Surface Water Samples

List of Attachments

Attachment 1.1 Data Package WAT031

Attachment 1.2 Data Package WAT032

Attachment 1.3 Data Package WAT033

Attachment 1.4 Data Package WAT034

Attachment 1.5 Data Package WAT035

TABLE OF CONTENTS

Attachment 1.6	Data Package WAT036
Attachment 1.7	Data Package WAT037
Attachment 1.8	Data Package WAT038
Attachment 1.9	Data Package WAT039
Attachment 1.10	Data Package WAT040
Attachment 1.11	Data Package WAT041
Attachment 1.12	Data Package WAT042
Attachment 1.13	Data Package WAT043
Attachment 1.14	Data Package WAT044
Attachment 1.15	Data Package WAT045
Attachment 1.16	Data Package TDSRA1
Attachment 1.17	Data Package WATRAS1

This data validation report is intended to provide the reader with a general overview of the usability of chemical data obtained from the January 2003 sampling activities at Molycorp. In addition, this data validation report is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

This report contains the results of the data validation conducted for groundwater samples collected in January of 2003 at the Molycorp Questa Mine, Questa, New Mexico. These water samples were collected in support of the Remedial Investigation/Feasibility Study (RI/FS). The water samples were sent to Severn Trent Laboratories (STL) Burlington in Colchester, VT. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods used and quality control samples collected were in accordance with the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). The results were reported in 15 original and 2 re-analyses data packages.

The groundwater and surface water samples collected during the January 2003 sampling event and their associated chemical analyses are summarized in Tables 1-1 and 1-2, respectively. These tables also provide the total number of groundwater and surface water samples collected and the number of each type of QC sample collected.

Table 1-1
Summary of Groundwater Samples Collected During January, 2003

Sample Identification	Dissolved Metals	Total Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
COLUMBINE1-T01N-GRW	x	x	x	x	x	x
COLUMBINE2-T01N-GRW	x, MS, LD	x, MS, LD	x, MS, LD	x, MS/MSD	x, MS/MSD	x, MS/MSD
COMPANYCABIN-T01N-GRW	x	x	x			x
DOUGLASWELL-T01N-GRW	x	x	x			x
EW-1-T01N-GRW	x, MS, LD	x, MS, LD	x, MS, LD			
EW-2-T01N-GRW	x	x	x			
EW-3-T01N-GRW	x	x	x			
EW-4-T01N-GRW	x	x	x			
EW-5A-T01N-GRW	x	x	x			
EW-5B-T01N-GRW	x	x	x			
EW-5C-T01N-GRW	x	x	x			
EW-5D-T01N-GRW	x	x	x			
EW-6(MW-3)-T01N-GRW	x, FD	x, FD	x, FD			
FAGERQUISTWELL-D01D-GRW	x, FD	x, FD	x, FD			x, FD
LABWELL-T01N-GRW	x	x	x	x	x	
LS-1-T01N-GRW	x	x	x			
LS-2-T01N-GRW	x	x	x			
LS-3-T01N-GRW	x, FD	x, FD	x, FD			
MMW-10A-T01N-GRW	x	x	x			x, FB
MMW-10B-T01N-GRW	x	x	x			x
MMW-10C-T01N-GRW	x	x	x			x
MMW-11-T01N-GRW-011303	x, FD	x, FD	x, FD			x, FD
MMW-11A-T01N-GRW-011403	x	x	x			x
MMW-13-T01N-GRW-011503	x, RB	x, RB	x, RB			x, RB
MMW-17B-T01N-GRW-010903	x, RB	x, RB	x, RB			x, RB
MMW-18A-T01N-GRW-011403	x	x	x			x

Table 1-1
Summary of Groundwater Samples Collected During January, 2003

Sample Identification	Dissolved Metals	Total Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
MMW-18B-T01N-GRW-011403	x	x	x			x
MMW-19A-T01N-GRW-011203	x	x	x			x
MMW-2-T01N-GRW-010703	x, MS, LD	x, MS, LD	x, MS, LD			
MMW-21-T01N-GRW-011103	x	x	x	x	x	x
MMW-22-T01N-GRW-011203	x	x	x	x	x	x
MMW-23A-T01N-GRW-010803	x	x	x			
MMW-23B-T01N-GRW-010803	x	x	x			
MMW-24-T01N-GRW-010903	x	x	x			x
MMW-25B-T01N-GRW-011003	x	x	x			x
MMW-28A-T01N-GRW-011003	x	x	x	x	x	x
MMW-28B-T01N-GRW-011003	x	x	x	x	x	x
MMW-29A-T01N-GRW-011303	x, MS, LD	x, MS, LD	x, MS, LD			x, MS/MSD
MMW-29B-T01N-GRW-011303	x	x	x			x
MMW-3-T01N-GRW-010703	x	x	x			
MMW-30A-T01N-GRW-011403	x	x	x			x
MMW-30B-T01N-GRW-011403	x, RB	x, RB	x, RB			x, RB
MMW-31A-T01N-GRW-011003	x	x	x			x
MMW-31B-T01N-GRW-011003	x, MS, LD	x, MS, LD	x, MS, LD			x, MS/MSD
MMW-32A-T01N-GRW-011603	x	x	x			x
MMW-32B-T01N-GRW-011603	x	x	x			x
MMW-33A-T01N-GRW-011603	x	x	x			x
MMW-34B-T01N-GRW-011103	x	x	x	x, FB	x, FB	x, FB
MMW-35B-T01N-GRW-011203	x	x	x	x	x	x
MMW-36B-T01N-GRW-011303	x	x	x	x, FB	x, FB	x, FB
MMW-38A-T01N-GRW-011303	x	x	x			x
MMW-39A-T01N-GRW-011603	x	x	x			
MMW-40A-T01N-GRW-011203	x	x	x	x	x	x
MMW-42A-T01N-GRW-011003	x	x	x			
MMW-42B-T01N-GRW-011003	x	x	x			
MMW-43A-T01N-GRW-011603	x	x	x	x	x	
MMW-44A-T01N-GRW-011403	x, RB	x, RB	x, RB	x, RB	x, RB	x, RB
MMW-44B-T01N-GRW-011503	x	x	x	x	x	x, FB
MMW-47A-T01N-GRW-010803	x, MS, LD	x, MS, LD	x, MS, LD	x, MS/MSD	x, MS/MSD	x, MS/MSD
MMW-48A-T01N-GRW-011603	x	x	x	x	x	x
MMW-7-T01N-GRW-010903	x	x	x	x	x	x
MMW-8A-T01N-GRW-010703	x, RB	x, RB	x, RB	x, RB	x, RB	x, RB
MMW-8B-T01N-GRW-010703	x	x	x	x	x	x
MW-1-T01N-GRW-010903	x	x	x			
MW-10-T01N-GRW-010903	x	x	x			
MW-11-T01N-GRW-011703	x, FD	x, FD x	x, FD x			X , FD
MW-12-T01N-GRW-011703	x	x	x			
MW-13-T01N-GRW-011103	x	x	x			
MW-14-T01N-GRW-011003	x, RB	x, RB	x, RB			
MW-15-T01N-GRW-011703	x	x	x			
MW-17-T01N-GRW-011003	x	x	x	x, FB	x, FB	
MW-2-T01N-GRW-011003	x	x	x			

Table 1-1
Summary of Groundwater Samples Collected During January, 2003

Sample Identification	Dissolved Metals	Total Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
MW-20-T01N-GRW-011503	x	x	x			
MW-24-T01N-GRW-011503	x	x	x			
MW-4-T01N-GRW-011603	x	x	x			
MW-7A-T01N-GRW-011603	x	x	x			
MW-7C-T01N-GRW-011703	x	x	x			
MW-9A-T01N-GRW-010703	x	x	x			
MW-A-T01N-GRW-011503	x	x	x			
MW-B-T01N-GRW-011703	x	x	x			
MW-CH-T01N-GRW-011703	x	x	x	x	x	
OUTFALL002-GRW-011103	x	x	x			
P-1-T01N-GRW-011203	x, FD	x, FD	x, FD	x, FD	x, FD	x, FD
P-2-T01N-GRW-011303	x, FD	x, FD	x, FD	x, FD	x, FD	x, FD
P-3-T01N-GRW-011303	x	x	x			x
P-4B-T01N-GRW-011403	x	x	x			x
P-5B-T01N-GRW-011503	x	x	x			x
P-5C-T01N-GRW-011503	x	x	x			x
US-1-T01N-GRW-011203	x	x	x			
US-2-T01N-GRW-011203-	x, FD	x, FD	x, FD			
US-3-T01N-GRW-012103	x, MS, LD	x, MS, LD	x, MS, LD			
CAPULINSPRING-T01N-GRW-010703	x, MS, LD	x, MS, LD	x, MS, LD			
GOATHILLSPRING-T01N-GRW-010703	x, FD	x, FD	x, FD			
LOWERSPRING13-T01N-GRW-010803	x	x	x			
SPRING10-T01N-GRW-011103	x	x	x			
SPRING12-T01N-GRW-011003	x	x	x			
SPRING13-T01N-GRW-010803	x	x	x			
SPRING14-T01N-GRW-010703	x	x	x			
SPRING14T-T01N-GRW-011003	x	x	x			
SPRING15-T01N-GRW-011003	x	x	x			
SPRING17-T01N-GRW-011003	x	x	x			
SPRING18-T01N-GRW-011003	x, RB	x, RB	x, RB			
SPRING39-T01N-GRW-0107803	x	x	x			
SPRING9-T01N-GRW-011103	x	x	x			
Number GRW Samples	106	106	106	25	25	50
Number MS/MSD or MS/LD	8	8	8	2	2	4
Number of Field Duplicates	8	8	8	3	3	4
Number of Rinsate Blanks	8	8	8	2	2	4
Number Field Blanks	0	0	0	3	3	4

FB = Field Blank MS/MSD = Matrix Spike/Matrix Spike Duplicate RB = Rinsate Blank FD = Field Duplicate
MS = Matrix Spike LD = Laboratory Duplicate

Notes:
1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

Table 1-2
Field Identification of Surface Water Samples Collected During Fall 2002

Analyses	Total Metals	Dissolved Metals	Inorganics	VOC	SVOC	Explosives
SAMPLE IDENTIFICATION						
DECANT-T01N-SFW-011103	x	x	x	Diesel Range Organics		
RR-10-T01N-SFW-012103	x	x	x			
RR-10A1-T01N-SFW-012003	x	x	x			
RR-11A1-T01N-SFW-012003	x	x	x			
RR-11C-T01N-SFW-012003	x	x	x			
RR-12-T01N-SFW-012003	x	x	x			
RR-13-T01N-SFW-012003	x, FD	x, FD	x, FD			
RR-14-T01N-SFW-011903	x, MS, LD	x, MS, LD	x, MS, LD			
RR-16-T01N-SFW-011903	x	x	x			
RR-7-T01N-SFW-011103	x	x	x			
Number SFW samples	10	10	10	0	0	0
Number MS/MSD or MS/LD	1	1	1	0	0	0
Number of Field Duplicates	1	1	1	0	0	0
Number of Rinsate Blanks	1	1	1	0	0	0
Number of Field Blanks	0	0	0	0	0	0

FB = Field Blank MS/MSD = Matrix Spike/Matrix Spike Duplicate RB = Rinsate Blank FD = Field Duplicate
MS = Matrix Spike LD = Laboratory Duplicate

Notes:
1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".
2. Analyses added by request on associated C-O-C form; not included in original FSP.

The QAPP required that the quality control samples listed above be collected at a frequency of 5%. As illustrated by the table above, the required frequency of QC analyses was satisfied for each analysis type for each sample matrix.

During review of the October and December 2002 groundwater and surface water data sets, it became apparent that there were matrix-related analysis problems. The laboratory conducted several studies in order to determine analysis solutions to the matrix related analysis problems. Each analysis problem, investigation, and solution is described in detail in the Data Validation Report for the Fall 2002 groundwater and surface water samples. As a result of this matrix related analysis problem and subsequent studies, various samples required reanalysis, as summarized below.

- Several samples from the January 2003 groundwater and surface water sampling event were reanalyzed for TDS. The decision to reanalyze selected samples for TDS was based on the ratio of the measured TDS to the calculated TDS being outside the acceptance range of 0.5 to 1.5. Results for the reanalyses were generally lower that the initial results. In all cases, the results for the reanalyses yielded acceptable measured vs. calculated TDS ratios. As such, the results for the reanalyses were selected for reporting.
- The surface water samples were reanalyzed for dissolved aluminum, arsenic and cadmium without dilution so that lower reporting limits could be attained. The results for the reanalyses were selected for reporting and the data sheets were annotated accordingly.

A summary of the January 2003 samples which were reanalyzed is provided in the following table. The table includes a listing of the data package in which the original results were reported and the data package in which the reanalysis results are reported.

Table 2-1
Re-analyses Summary for Water Samples Collected During January 2003

Site ID	PH Category	Dissolved Al, As, and Cd ("-D01N-")	TDS ("-T01N-")	Original SDG	Re-analysis SDG
LABWELL-TO1N-GRW	B		x	WAT035	TDSRA1
MMW-42A-T01N-GRW	A		x	WAT035	TDSRA1
MMW-28A-T01N-GRW	B		x	WAT035	TDSRA1
MMW-28B-T01N-GRW	A		x	WAT035	TDSRA1
COLUMBINE2-T01N-GRW	A		x	WAT035	TDSRA1
MMW-31A-T01N-GRW	A		x	WAT035	TDSRA1
SPRING12-T01N-GRW	C		x	WAT035	TDSRA1
SPRING18-T01N-GRW	C		x	WAT035	TDSRA1
MW-17-T01N-GRW	C		x	WAT035	TDSRA1
SPRING9-T01N-GRW	B		x	WAT037	TDSRA1
MMW-19A-T01N-GRW	A		x	WAT037	TDSRA1
SPRING15-T01N-GRW	B		x	WAT037	TDSRA1
US-2-T01N-GRW	B		x	WAT037	TDSRA1
US-2-T01D-GRW	B		x	WAT037	TDSRA1
SPRING10-T01N-GRW	B		x	WAT037	TDSRA1
P-2-T01N-GRW	A		x	WAT037	TDSRA1
SPRING14T-T01N-GRW	C		x	WAT037	TDSRA1
RR-14-D01N-SFW	C	x		WAT043	WATRAS1
RR-12-D01N-SFW	C	x		WAT043	WATRAS1
RR-13-D01N-SFW	B	x		WAT043	WATRAS1
RR-13-D01D-SFW	C	x		WAT043	WATRAS1
RR-16-D01N-SFW	C	x		WAT044	WATRAS1
RR-11C-DO1N-SFW	C	x		WAT044	WATRAS1

Table 2-1
Re-analyses Summary for Water Samples Collected During January 2003

Site ID	PH Category	Dissolved Al, As, and Cd ("-D01N-")	TDS ("-T01N-")	Original SDG	Re-analysis SDG
RR-10A1-D01N-SFW	B	x		WAT044	WATRAS1
RR-11A1-D01N-SFW	C	x		WAT045	WATRAS1
RR-7-D01N-SFW	B	x		WAT045	WATRAS1
RR-10-D01N-SFW	B	x		WAT045	WATRAS1

As noted in Section 4, the results for the reanalyses were reviewed in the same fashion as the original analyses. As a result of this review, the results obtained for reanalyses were selected for reporting.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, Inductively Coupled Plasma Spectroscopy (ICP) serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1, and is as follows: If no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used. If no criteria are specified in the SOP or the QAPP then the method-specified acceptance limits were used. If no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

Whenever professional judgment was exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative. As outlined in Section 2, some samples were reanalyzed for aluminum, arsenic, and cadmium or TDS. The reanalysis packages received the same review as the original packages. In all cases, the reanalysis results supercede those that were initially reported. Section 4 and Attachment 1 provide the data review narratives for each of the data packages, including the reanalysis packages.

After completing the review sample-specific and laboratory performance parameters in accordance with SOP 12.1, the site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. The reason for this is that site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC

measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 5.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Where applicable, the potential direction of bias (high, low, or indeterminate) has been indicated on the tables in the text, and noted on the sample results sheets as H, L, or I, respectively. Section 6.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 7.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

4.1 DATA REVIEW NARRATIVES

The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries, which are included in Attachment 1. The data qualifiers, reason codes, and bias codes have been marked on the data sheets, which are retained in the project files. The data validation qualifiers reason codes and bias codes are also stored in the electronic database.

4.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identified whether findings globally affect all relevant water samples analyzed for the January 2003 Groundwater and Surface Water Sampling Event. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

4.2.1 Holding Blanks

For the analysis of the volatile organic samples, a holding blank was carried through the sample storage period and analyzed in the same sequence as the samples in the data package. As all holding blank recoveries were all nondetect, the indication of the occurrence of potential cross-contamination during sample storage was unlikely.

4.2.2 Manual Integration

Manual integration was employed in deriving results for the volatile and semivolatile organics in a few data packages. The values that were derived from manual integration were qualified on the quantitation reports and extracted ion current profiles were included for each instance. The supporting documentation provided was reviewed and found to be adequate.

4.2.3 Low-level Detections

Detected organic analytes with concentrations between the Method Detection Limit (MDL) and the Reporting Limit (RL) were qualified as estimated (J). A qualifier code of “SQL-I” (Sample Quantitation Limit) was assigned to reflect the greater uncertainty in quantitative values below the RL.

4.2.4 TICS Reported in Blanks

Several Tentatively Identified Compounds (TICs) were reported as present in the semivolatile blanks for each package. The unknown compounds detected in the method blank were qualified as (NJ) to denote the analyses indicated the presence of an analyte that had been “tentatively identified” and the associated numerical value represented its approximate value. However, if similar TICs were present in the associated samples, the results were not considered to be

reportable due to laboratory contamination (as indicated by the blank) and therefore, flagged as unusable (R). After evaluating sample TICs based on laboratory method blanks, any remaining TICs were qualified as "NJ."

4.2.5 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

4.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses:

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilbria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

4.2.7 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

4.2.8 Laboratory Performance Review (LPR) Findings

As mentioned previously, two data packages, WAT038 and WAT043, were given a full validation to assess the performance of the laboratory for all analyses. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all

packages for the event. The laboratory performance parameters evaluated for all packages for this event included:

- Initial calibration results for VOCs and SVOCs.
- Continuing calibration results for VOCs and SVOCs.
- Explosives LCS results.

In general, qualification was limited to the parent sample if fewer than a quarter of the applicable matrix spike recoveries were outside the acceptance range. Conversely, if more than a quarter of the applicable matrix spike recoveries were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average matrix spike recovery, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

The site-specific Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, method duplicate (MD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three sections present a discussion on the MS/MSD analyses, MD analyses, and the serial dilution results for the groundwater and surface water samples collected during the January, 2003 sampling event.

5.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Additional aliquots of two groundwater and one surface water sample were submitted for use in matrix QC analyses. Table 5-1 below summarizes the site-samples that were used to prepare matrix spike and matrix spike duplicate samples.

Table 5-1
Field Samples Submitted for Matrix Spike/Matrix Spike Duplicates

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
COLOMBINE2-T01N-GRW	Groundwater	WAT035	x	x	x	x	x	x
EW-1-T01N-GRW	Groundwater	WAT033	x	x	x			
MMW-2-T01N-GRW	Groundwater	WAT031	x	x	x			
MMW-29A-T01N-GRW	Groundwater	WAT039	x	x	x			x
MMW-31B-T01N-GRW	Groundwater	WAT038	x	x	x			x
MMW-47A-T01N-GRW	Groundwater	WAT032	x	x	x	x	x	x
US-3-T01N-GRW	Groundwater	WAT038	x	x	x			
CAPULINSPRING-T01N-GRW	Groundwater	WAT032	x	x	x			
RR-14-T01N-SFW	Surface Water	WAT043	x	x	x			

Notes:
1. For metals and inorganic analyses, a single matrix spike sample was analyzed.
2. For organic analyses, duplicate matrix spike samples were analyzed.
3. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

The following table lists the groundwater and surface water MS/MD sample sets relative to the number of field samples.

Table 5-2
Count of Matrix Spike Samples Collected in January 2003

Analyses	Number of MS samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	8	106	8
Dissolved Metals	8	106	8
Wet Chemistry	8	106	8
VOC	2	25	8
SVOC	2	25	8
Explosives	4	50	8

Table 5-2
Count of Matrix Spike Samples Collected in January 2003

Analyses	Number of MS samples	Total Samples	Percentage (%)
SURFACE WATER			
Total Metals	1	10	10
Dissolved Metals	1	10	10
Wet Chemistry	1	10	10
VOC	NA	NA	NA
SVOC	NA	NA	NA
Explosives	NA	NA	NA

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

5.1.1 Groundwater Matrix Spike

Although the majority of the groundwater matrix spike recoveries were within acceptance limits, some were not. Table 5-3 summarizes the spike recoveries that were outside acceptance limits and the subsequent result qualification applied to the associated samples.

Table 5-3
Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte (Control Limits %)	Sample ID	MS or MS and MSD Recoveries	Frequency of Limit Exceedance[1]	Action
METALS				
Total Aluminum	EW-1-T01N-GRW	72.6	1 of 3 Total	J/UJ MS-L for parent sample
Dissolved Aluminum	EW-1-D01N-GRW	73.0	1 of 4 Dissolved	J/UJ MS-L for parent sample
Total Antimony	CAPULINSPRING-T01N-GRW	58.0	1 of 8 Total	J/UJ MS-L for parent sample
Dissolved Antimony	CAPULINSPRING-D01N-GRW	51.2	1 of 8 Dissolved	J/UJ MS-L for parent sample
Dissolved Arsenic	MMW-29A-D01N-GRW	50.7	1 of 8 Dissolved	J/UJ MS-L for parent sample
Total Barium	CAPULINSPRING-T01N-GRW	13.8	1 of 8 Total	J/UJ MS-L for parent sample
Dissolved Barium	CAPULINSPRING-D01N-GRW	16.2	1 of 8 Dissolved	J/UJ MS-L for parent sample
Total Boron	CAPULINSPRING-T01N-GRW	64.2	1 of 8 Total	J/UJ MS-L for parent sample
Dissolved Boron	CAPULINSPRING-D01N-GRW	61.0	1 of 8 Dissolved	J/UJ MS-L for parent sample
Dissolved Copper	MMW-2-D01N-GRW	73.3	1 of 3 Dissolved	J/UJ MS-L for parent sample
Total./ Dissolved Molybdenum	CAPULINSPRING-T01N-GRW	39.7	1 of 8 Total	J/UJ MS-L for parent sample
	CAPULINSPRING-D01N-GRW	40.7	1 of 8 Dissolved	J/UJ MS-L for parent sample
Total Zinc	MMW-47A-T01N-GRW	71.8	1 of 3 Total	J/UJ MS-L for parent sample
Total Cyanide	MMW-2-T01N-GRW	55.9	2 of 7 Total	J/UJ for all cyanide results J/UJ MS-L[2]
	MMW-29A-T01N-GRW	7.3		
WET CHEMISTRY				
TKN	MMW-2-T01N-GRW	156.5	1 of 8	J/UJ MS-H for parent sample
Nitrite	CAPULINSPRING-T01N-GRW	38.4	1 of 8	J/UJ MS-L for parent sample
Total Alkalinity and Bicarbonate Alkalinity	MMW-2-T01N-GRW	196.4	NA	None[3]
	CAPULINSPRING-T01N-GRW	2.8	NA	
	COLUMBINE2-T01N-GRW	21.0	NA	

Table 5-3
Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte (Control Limits %)	Sample ID	MS or MS and MSD Recoveries	Frequency of Limit Exceedance[1]	Action
VOC				
All results were within criteria				
SVOC				
All results were within criteria				
EXPLOSIVES				
PYX (70-130)	MMW-47A-T01N	18 and 14	3 of 3	J/UJ MS-L for all sample results.
	COLUMBINE2-T01N-GRW	10 and 12		
	MMW-31B-T01N-GRW	21 and 40		

[1] Only matrix spike results with applicable spike levels were included in the listed frequency. As such, the total number of matrix spikes considered appropriate for assessing accuracy may be less than the number listed in Table 5-2.
[2] It was not considered necessary to reject non-detects for Cyanide as the acidic nature as the samples would not allow for Cyanide to be formed or persist in the natural environment.
[3] Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the accepted range of 75-125% in the sample specific reviews. However, using professional judgement, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses are not a pertinent measure of accuracy. The highly variable pH range of the water and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the analysis. The matrix spiked samples were found to have significantly different pHs than the parent samples, due to the presence of carbonate confounded by a dilution effect.
Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy of the analysis.

For cyanide and PYX, it was considered necessary to extend qualification to the balance of the January 2003 groundwater samples because more than a quarter of the spike results were outside evaluation criteria. While two of seven cyanide matrix spike recoveries were low, the average matrix spike recovery, 84% was within limits. The low recoveries for the two samples may be due to their native low pH. However, as a conservative measure, qualification based on low matrix recovery was extended to all cyanide results.

Throughout the RI/FS investigation, the matrix spike recoveries of PYX were very low. For the January 2003 groundwater samples, the average matrix spike recovery was 14%, which is outside of the laboratory's advisory range of 70-130%, but above the 10% criterion for organics that would require rejection of nondetect results. Similarly, the LCS recoveries for PYX were generally low with recoveries averaging in the 50 to 60% range. All PYX results for field samples were reported as nondetect at the reporting limits of 0.25 ug/l, which is below the QAPP-required RL of 1.0 ug/l. The QAPP did not contain any risk-based screening criteria for PYX.

The PYX results are still considered usable in risk evaluations despite the low bias suggested by the matrix spike results, but the data user needs to understand the magnitude of the potential low bias. As the average matrix spike recoveries for this event was 13%, the associated RL could be potentially biased low by a factor of almost 8. For this reason, all PYX results were qualified as estimated (UJ MS, LCS – L). The data users should recognize that the nondetect PYX results should be considered usable for showing that the PYX concentration is less than a decision criterion of 2.0 ug/l or higher based on the magnitude of potential low bias suggested by the average matrix spike recovery. However, the PYX results can not be used, with confidence, for saying that the concentration is less than a decision criterion that is less than 2.0 ug/l.

Although results for some analytes were qualified based on matrix spike recoveries, none warranted rejection. Additionally, the vast majority (>96%) of matrix spike results were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

5.1.2 Surface Water Matrix Spike

Although the majority of the surface water matrix spike recoveries were within acceptance limits, some were not. Table 5-4 summarizes the spike recoveries that were outside acceptance limits and the subsequent result qualification applied to the associated samples.

Table 5-4
Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Analyte (Control Limits %)	Sample ID	MS or MS and MSD or MS (PDS) (%R)	Frequency of Limit Exceedance	Action
METALS* **All results were within criteria**				
Total Iron	RR-14-T01N-SFW	73.5	1 of 1 Total	J/UJ MS-L for all total sample results.
Dissolved Iron	RR-14-D01N-SFW	125.7	1 of 1 Dissolved	J/UJ MS-H for all detect dissolved sample results.
WET CHEMISTRY				
Sulfate	RR-14-T01N-SFW	66.0	1 of 1	J/UJ MS-L for all sample results.
Nitrate	RR-14-T01N-SFW	128.6	1 of 1	J/UJ MS-H for all detect sample results.
VOC				
All results were within criteria				
SVOC				
All results were within criteria				
EXPLOSIVES				
All results were within criteria				

For each of the analytes listed in the table above, it was considered necessary to extend qualification to the balance of the January 2003 surface water samples the only MS measurement were outside evaluation criteria.

Although results for some analytes were qualified based on matrix spike recoveries, none warranted rejection. Additionally, the vast majority (>93%) of the surface water matrix spike results were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

5.2 SPIKE DUPLICATE RESULTS AND LABORATORY DUPLICATES (PRECISION EVALUATION)

The following subsections to the precision of analytical results based on their reproducibility. Section 5.2.1 discusses the organic analyses for which precision was evaluated by analysis of

duplicate spiked samples. Section 5.2.2 discusses the metals and inorganic analyses for which precision was evaluated by the analysis of laboratory duplicates.

5.2.1 Organic Analyses (MS/MSD Relative Percent Difference (RPD))

The relative percent differences between MS and MSD results for target analytes contained in the spiking solutions used by the laboratory were within QAPP acceptance limits. No groundwater or surface water results were qualified based on the RPD between the MS and the MSD results. As such, the precision of the organic analyses relative to the site-specific matrix is considered to be acceptable.

5.2.2 Metals and Inorganic Laboratory Duplicates

The laboratory duplicate sample analysis results are used to evaluate the precision of the laboratory analyses. The evaluation criteria used are dependent on the concentration of the analyte in the sample. Acceptable precision is demonstrated by an RPD<20% when both results are more that five times the reporting limit (RL). When either sample concentration is <5xRL, acceptable precision is demonstrated by an absolute difference between results of < 1xRL. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was used as the RL for these concentration dependent evaluations because the laboratory reported the IDLs as the quantitative RLs. The IDLs are considered to be too low for such comparisons to be meaningful. Additionally, using the CLP CRDL is consistent with The National Functional Guidelines, which were used as guidance for data review in addition to SOP 12.1

All laboratory duplicate results satisfied the applicable evaluation criterion. Therefore, no qualifications of data were necessary on the basis of laboratory duplicate results. As such, the laboratory duplicate results are considered to indicated that acceptable levels of overall precision (sampling and analytical) were attained on the site-specific matrix.

5.3 SERIAL DILUTION RESULTS

ICP serial dilutions are analyzed to help evaluate whether or not interferences exist due to sample matrix. When analyte concentrations are sufficiently high (defined as minimally 50x greater than the instrument detection limit [IDL}), results for a straight and five fold dilution are expected to agree within 10%. Otherwise interferences resulting in signal suppression or enhancement might be suspected.

In general, qualification was limited to the parent sample if fewer than a quarter of the applicable serial dilution results were outside the acceptance range. Conversely, if more than a quarter of the applicable serial dilution results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average %D, the magnitude of the exceedances, and the number of valid results relative to the size of the sample set.

5.3.1 Groundwater Serial Dilutions

Table 5-5 below lists the groundwater samples that were used to perform serial dilution tests and analytes for which the evaluation was applicable. With two exceptions denoted in the table

below, the percent differences (%Ds) between the original sample results and the result obtained from a five-fold diluted sample were all <10%.

Table 5-5
Serial Dilution Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte	Number of Valid Results	%Ds >10%	Potential Bias Direction		Action
			Low	High	
Total Beryllium	1	1	1	0	
Dissolved Beryllium	1	1	1	0	
Total Zinc	1	1	1	0	
Dissolved Zinc	1	1	1	0	

Data qualification was issued to only the parent sample because The problematic parent sample was Capulin Spring. This has a very low pH (2.5 to 3.0) and high conductivity. It is not considered to be generally representative of the groundwater matrix. In addition, one data point was not considered significant for extending qualification to the entire groundwater data set.

5.3.2 Surface Water Serial Dilutions

Four surface water samples were analyzed for serial dilution. The percent differences (%Ds) between the original sample results and the result obtained from a five-fold diluted sample were all <10% for applicable results. Therefore, no qualifications of data were necessary.

The site-specific field duplicate samples, rinsate blanks and field blanks were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrices. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

6.1 FIELD DUPLICATE SAMPLES

The field duplicate sample analysis results may be used to evaluate the overall precision of the analyses (analytical and sampling precision) and/or the sample representativeness. The following concentration dependent evaluation was used. Where both results were greater than or 5 times the Reporting Limit (RL), the Relative Percent Difference (RPD) between the results was compared to a criterion of ≤25%. If either result was less than 5 times the RL, the absolute difference was compared to a criteria of ≤ 2xRL. Similar to the laboratory duplicate evaluations, the CRDL was used as the RL for these comparisons.

In general, qualification was limited to the parent sample if fewer than a quarter of the field duplicate results were outside the acceptance range. Conversely, if more than a quarter of the field duplicate results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the magnitude of the exceedances (marginal vs. gross) and the complexity of the sample matrix.

Field duplicate samples were collected during this sampling event for metals, wet chemistry, Volatile Organic Compounds (VOCs), Semivolatile Organic Compounds (SVOCs), and explosives. Tables 6-1 and 6-2 below summarize the field duplicate samples collected and the frequency of field duplicate collection per analysis type, respectively.

Table 6-1
Water Samples Submitted for Field Duplicate Analyses

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
GOATHILLSPRING-T01N-GRW GOATHILLSPRING-T01D-GRW	Groundwater	WAT031	x	x	x			
EW-6(MW-3)-T01N-GRW EW-6(MW-3)-T01D-GRW	Groundwater	WAT033	x	x	x			
LS3-T01N-GRW LS3-T01D-GRW	Groundwater	WAT036	x	x	x			
P-1-T01N-GRW P-1-T01D-GRW	Groundwater	WAT036	x	x	x	x	x	x
P-2-T01N-GRW P-2-T01D-GRW	Groundwater	WAT036/WAT037	x	x	x	x	x	x
US-2-T01N-GRW US-2-T01D-GRW	Groundwater	WAT037	x	x	x			
MMW-11-T01N-GRW MMW-11-T01D-GRW	Groundwater	WAT039	x	x	x			x
FAGERWELL-T01N-GRW FAGERWELL-T01D-GRW	Groundwater	WAT044/WAT045	x	x	x			x

Table 6-1
Water Samples Submitted for Field Duplicate Analyses

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
RR-13-T01N-SFW RR-13-T01D-SFW	Surface water	WAT043	x	x	x			

1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

Table 6-2
Field Duplicate Collection Frequency
for the January 2003 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	8	106	8
Dissolved Metals	8	106	8
Wet Chemistry	8	106	8
VOC	3	25	12
SVOC	3	25	12
Explosives	4	50	8
SURFACE WATER			
Total Metals	1	10	10
Dissolved Metals	1	10	10
Wet Chemistry	1	10	10
VOC	0	0	0
SVOC	0	0	0
Explosives	0	0	0

As shown on the above table, the 5% (or 1 in 20) frequency specification for field duplicates was met for the groundwater and surface water samples.

6.1.1 Groundwater Field Duplicate Results

The groundwater field duplicate sample results not meeting acceptance criteria and the resultant data qualification issued is summarized in Table 6.1.3 below.

Table 6-3
Groundwater Field Duplicate Outliers and Corresponding Results
Qualification for Groundwater Samples

Sample ID	Analyte	RPD or Difference	Comment	Action
METALS				
GOATHILLSPRING-T01N-GRW GOATHILLSRPING-T01D-GRW	Iron	31.3	1 pair of 8 pairs	Qualify iron as estimated (J/UJ FD-I) for parent and field duplicate sample only.
GOATHILLSPRING-T01N-GRW GOATHILLSRPING-T01D-GRW	Lead	36.5	1 pair of 8 pairs	Qualify lead as estimated (J/UJ FD-I) for parent and field duplicate sample only.
WET CHEMISTRY **All results were within criteria**				
GOATHILLSPRING-T01N-GRW GOATHILLSRPING-T01D-GRW	TSS	46.0	2 pairs of 8 pairs	Qualify TSS as estimated (J/UJ FD-I) for parent and field duplicate sample only.
EW-6 (MW-3) T01N-GRW EW-6 (MW-3) T01D-GR		5.2 x RL		
P-2-T01N-GRW P-2-T01N-GRW	TDS	45.3	1 pair of 8 pairs	Qualify TDS as estimated (J/UJ FD-I) for parent and field duplicate sample only.
P-1-T01N-GRW P-1-T01D-GRW	Chloride	3.9 x RL	3 pairs of 8 pairs	Qualify chloride as estimated (J/UJ FD-I) for parent and field duplicate results only.
P-2-T01N-GRW P-2-T01N-GRW		39.8 x RL		
MMW-11-T01N-GRW MMW-11-T01D-GRW		19.7 x RL		
EW-6 (MW-3) T01N-GRW EW-6 (MW-3) T01D-GR	Orthophosphate	24.3 x RL	4 pairs of 9 pairs	Qualify orthophosphate as estimated (J/UJ FD-I) for all sample results.
P-1-T01N-GRW P-1-T01D-GRW		72 x RL		
US-2-T01N-GRW US-2-T01D-GRW		130 x RL		
MMW-11-T01N-GRW MMW-11-T01D-GRW		16 x RL		
P-2-T01N-GRW P-2-T01N-GRW	Ammonia	2.4 x RL	1 pair of 9 pairs	Qualify ammonia as estimated (J/UJ FD-I) for parent and field duplicate sample only.
VOC				
All results were within criteria				
SVOC				
All results were within criteria				
EXPLOSIVES				
All results were within criteria				

Data qualification for chloride and orthophosphate were extended to all samples because greater than a quarter of the field duplicate results were outside the applicable evaluation criterion and the exceedances were not considered marginal. The results were qualified as estimated with an indeterminate bias direction.

Although some results were qualified based on field duplicate agreement, the vast majority (>99%) of the field duplicate results were within limits.

6.1.2 Surface Water Field Duplicates Results

All field duplicate results were within evaluation criteria for surface water samples, therefore, no qualifications of data were necessary.

6.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Table 6-4 lists the rinsate blanks that were collected during the January 2003 sampling event and the parameters for which they were analyzed.

Table 6-4
Rinsate Blanks Collected During the January 2003 Sampling Event

Sample ID (Date)[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Wet Chemistry	Volatile Organics	Semivolatile Organics	Explosives
RB01T-GRW (01/14)	Groundwater	WAT041	x	x	x	x	x	x
RB02T-GRW (01/07)	Groundwater	WAT032	x	x	x	x	x	x
RB03T-GRW (01/15)	Groundwater	WAT041	x	x	x			x
RB04T-GRW (01/14)	Groundwater	WAT040	x	x	x			x
RB05T-GRW (01/10)	Groundwater	WAT034	x	x	x			
RB06T-GRW (01/09)	Groundwater	WAT034	x	x	x			
RB07T-GRW (01/12)	Groundwater	WAT038	x	x	x			
RB08T-GRW (01/10)	Groundwater	WAT038	x	x	x			
RB01T-SFW (01/20)	Surface water	WAT045	x	x	x			

[1] For the dissolved metals, the "T" portion of the field ID was changed to "D".

The QAPP required frequency of 5% for the collection of rinsate blanks was met for the January, 2003 water sampling event.

The rinsate blank detections results and the resulting data qualification issued is summarized in the following table. To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result or biasing the average high by using the reporting limit.

6.2.1 Groundwater Rinsate Blanks

The following groundwater rinsate blank results and their effects regarding groundwater results qualification are provided in the following table:

Table 6-5
Groundwater Rinsate Blank Outliers and Corresponding Results
Qualification for Samples Collected During January 2003

Analyte	Sample ID	Conc.	Ave Conc.	RL	Frequency of Detection	Range for Field Samples	Action
METALS (ug/L)							
Total Aluminum	RB02T-GRW	237	91.8	142	1 of 8	142 to 1,520,000	Total aluminum results <485.8 ug/L were qualified as nondetect (U RB-I).
Total Cobalt	RB02T-GRW	2.0	0.95	1.6	1 of 8	1.6 to 3,480	Total cobalt results <4.75 ug/L were qualified as nondetect (U RB-I).
Total Copper	RB05T-GRW	2.8	1.49	1.7	2 of 8	1.7 to 9,640	Total copper results <7.47 ug/L were qualified as nondetect (U RB-I).
	RB07T-GRW	2.3					
Total Manganese	RB02T-GRW	102	14.9	5	1 of 8	5 to 533,000	Total manganese results <74.7 ug/L were qualified as nondetect (U RB-I).
Total Nickel	RB02T-GRW	2.2	0.931	1.5	1 of 8	1.5 to 8,270	Total nickel results <4.66 ug/L were qualified as nondetect (U RB-I).
DISSOLVED METALS (ug/l)							
Dissolved Beryllium	RB07D-GRW	1.3	0.271	0.2	1 of 8	0.2 to 230	Dissolved beryllium results <1.36 ug/L were qualified as nondetect (U RB-I)
Dissolved Copper	RB05D-GRW	1.8	1.25	1.7	2 of 8	1.7 to 9,560	Dissolved copper results <6.25 ug/L were qualified as nondetect (U RB-I)
	RB07D-GRW	1.8					
Dissolved Manganese	RB07D-GRW	1.8					
Dissolved Zinc	RB03D-GRW	240	51.0	39.0	1 of 8	28 to 109,000	Dissolved zinc results <255.0 ug/L were qualified as nondetect (U RB-I)
INORGANICS (mg/L)							
Ammonia	RB01T-GRW	0.04	0.075	0.04	7 of 8	0.04- 3.1	Ammonia results < 0.376 mg/Lwere qualified as nondetect (U RB-I)
	RB03T-GRW	0.046					
	RB04T-GRW	0.043					
	RB05T-GRW	0.078					
	RB06T-GRW	0.052					
	RB07T-GRW	0.15					
	RB08T-GRW	0.18					
Total Alkalinity and Bicarbonate Alkalinity	RB01T-GRW	3.2	2.71	1.0	8 of 8	1-645	Total Alkalinity and Bicarbonate Alkalinity results < 13.6 mg/Lwere qualified as nondetect (U RB-I)
	RB02T-GRW	2.0					
	RB03T-GRW	2.7					
	RB04T-GRW	3.2					
	RB05T-GRW	2.5					
	RB06T-GRW	2.7					
	RB07T-GRW	2.6					
	RB08T-GRW	2.8					
Chloride	RB04T-GRW	6.7	1.17	0.4	3 of 8	0.45-266	Chloride results < 5.86 mg/L were qualified as nondetect (U RB-I)
	RB07T-GRW	1.4					
	RB08T-GRW	0.27					

Table 6-5
Groundwater Rinsate Blank Outliers and Corresponding Results Qualification for Samples Collected during January, 2003

Analyte	Sample ID	Conc.	Ave Conc.	RL	Frequency of Detection	Range for Field Samples	Action
Hydroxide	RB01T-GRW	3.2	1.11	1.0	2 of 8	1-174	Hydroxide results < 5.56 mg/L were qualified as nondetect (U RB-I)
	RB03T-GRW	2.7					
Nitrate	RB06T-GRW	0.52	0.28	0.4	2 of 8	0.2-29.9	Nitrate results < 1.34 mg/L were qualified as nondetect (U RB-I)
	RB07T-GRW	0.52					
Orthophosphate	RB01T-GRW	0.035	0.612	0.01	4 of 8	0.1-31.6	Orthophosphate results < 3.06 mg/L were qualified as nondetect (U RB-I)
	RB02T-GRW	0.012					
	RB03T-GRW	0.43					
	RB05T-GRW	4.4		0.5			
TDS	RB01T-GRW	9.0	19.1	5.0	6 of 7	98-19,700	TDS results <90.5 mg/L were qualified as nondetect (U RB-I)
	RB02T-GRW	23.0					
	RB03T-GRW	7.0					
	RB05T-GRW	46.0					
	RB07T-GRW	21.0					
	RB08T-GRW	23.0					
TKN	RB01T-GRW	0.33	0.187	0.24	2 of 8	0.24-3.1	TKN results <0.937 mg/L were qualified as nondetect (U RB-I)
	RB02T-GRW	0.45					
TSS	RB01T-GRW	0.5	0.4	0.5	4 of 8	0.5-8,690	TSS results <2.0 mg/L were qualified as nondetect (U RB-I)
	RB02T-GRW	0.6					
	RB03T-GRW	0.5					
	RB07T-GRW	0.6					
VOCs (ug/L)							
All rinsate blank results were nondetect							
SVOCs (ug/L)							
Di-n-Butyl phthalate	RB01T-GRW	0.5	0.50[1]	10	1 of 2	0.5- 11	Di-n-butylphthalate results <2.50 ug/L were qualified as nondetect (U RB-I)
Diethyl phthalate	RB01T-GRW	0.6	0.55[1]	10	1 of 2	0.5- 11	Diethylphthalate results < 2.75 ug/L were qualified as nondetect (U RB-I)
EXPLOSIVES							
All rinsate blanks were nondetect							

ND= Nondetect MDL=Method Detection Limit RL= Reporting Limit

[1] In calculating the average RB concentrations, a value of 1 was used for nondetect results, rather than the CRQL, as this value was considered more representative of the level down to which the laboratory reports positive results.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were generally infrequent and detections were at low levels.

6.2.2 Surface Water Rinsate Blanks

The surface water rinsate blank results and their effects regarding groundwater results qualification are provided in the following table:

Table 6-6
Surface Water Rinsate Blank Outliers and Corresponding Results Qualification for Surface Water Samples

Analyte	Sample ID	Conc.	Ave. Conc.	RL	Frequency of Detection	Range for Field Samples	Action
METALS (ug/l)							
Molybdenum	RB01T-SFW	1.3	1.3	1.1	1 of 1	1.1-4.4	Total molybdenum results <6.5 ug/L qualified as nondetect (U RB-I)
INORGANIC PARAMETERS (mg/L)							
All rinsate blank concentrations were below qualification levels							
EXPLOSIVES							
All rinsate blank results were non-detect.							

ND= Nondetect MDL=Method Detection Limit RL= Reporting Limit

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

6.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field blanks are only required to be collected by the project QAPP when samples are analyzed for organics.

With one exception, all groundwater field blank results were non-detect for VOC, SVOC, and explosive compounds. Of the 60 total SVOC compounds analyzed for in field blanks FB01T-GRW (01/13) only one compound was detected as summarized in the table below.

Field Blank ID	Compound	Concentration ug/L	Sample Result Qualification
FB01T-GRW	Bis (2-ethylhexyl)phthalate	0.8	None Necessary

Data qualification on the basis of field blank was not necessary because the single analyte detected was not detected in any field samples.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank contamination. In addition, some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summaries. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

7.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

Of 543 lab duplicate results, all satisfied the applicable evaluation criteria, for a total of 100%. Of 536 field duplicate results, 523 satisfied the applicable evaluation criteria, for a total of 98%. As such, the overall level of precision, both analytical and combined analytical and sampling, demonstrated is considered to be acceptable.

7.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of Laboratory Control Samples (LCSs) and MSs.

Greater than 99% of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP. This indicates acceptable overall accuracy with respect to the analytical system. Four PYX recoveries were below evaluation criteria and qualification was issued in the sample specific review.

Ninety-five percent of the MS recoveries (506 valid of 531 recoveries) satisfied the applicable evaluation criteria for accuracy specified in the QAPP, indicating that acceptable overall accuracy was attained with respect to the site matrix.

7.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements in relation to the number of measurements requested.

There were 116 surface and groundwater samples collected during the January 2003 sampling event. All samples yielded valid results for all target analytes, consequently the completeness achieved was 100%.

7.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting Field Sampling Plan

FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the groundwater and surface water samples. The close agreement between the field duplicate results, as discussed above in Section 6.1, indicates that the samples collected were adequately representative of the media sampled.

Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. Again, the close agreement between duplicates noted in Section 6.1 indicates that sample processing and subsampling procedures were acceptable.

7.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

7.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. As such, obtaining some nondetect results with elevated reporting limits was not avoidable. While it is anticipated that all data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT031 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 3/6/03

Peer Reviewer: Alan Roberts Date Completed: 3/26/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
MMW-2-T01N-GRW	SA	514132		W	X	X					
MMW-2-D01N-GRW	SA	514133		W	X						
MMW-3-T01N-GRW	SA	514134		W	X	X					
MMW-3-D01N-GRW	SA	514135		W	X						
MMW-8A-T01N-GRW	SA	514136	MMW8AT01NGRW	W	X	X	X	X	X		
MMW-8A-D01N-GRW	SA	514137		W	X						
MW-1-T01N-GRW	SA	514138		W	X	X					
MW-1-D01N-GRW	SA	514139		W	X						
MW-9A-T01N-GRW	SA	514140		W	X	X					
MW-9A-D01N-GRW	SA	514141		W	X						
GOATHILLSPRING-T01N-GRW	SA	514142	GOATHILLSPRG-T01N-GRW or GOATHILLSPRG-T01N-G	W	X	X					
GOATHILLSPRING-D01N-GRW	SA	514143	GOATHILLSPRG-D01N-GRW	W	X						
GOATHILLSPRING-T01D-GRW	FD	514144	GOATHILLSPRG-T01=-D-GRW	W	X	X					
GOATHILLSPRING-D01D-GRW	FD	514145	GOATHILLSPRG-D01D-GRW	W	X						
MMW-8B-T01N-GRW	SA	514146	MMW8BT01NGRW	W	X	X	X	X	X		
MMW-8B-D01N-GRW	SA	514147		W	X						
SPRING14-T01N-GRW	SA	514148		W	X	X					
SPRING14-D01N-GRW	SA	514149		W	X						
RB14T-SOL	RB	514150		W	X	X				X	X
RB15T-SOL	RB	514151		W	X	X					
TB87T-SOL	TB	514152		W			X				
TB18T-GRW	TB	514153		W			X				

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The samples in this sample delivery group (SDG) were re-analyzed for sulfate by method 375.4. The re-analysis was requested after the analytical holding time had expired. The raw data from the original sulfate analyses by method 300.0, which were performed within the holding time, are provided in the data package. The results from the re-analyses are formally presented in the case submittal. Table 1.1 below summarizes the qualification for sulfate holding time.

During the alkalinity analysis of the samples in this SDG, the associated blank samples CCB3 and CCB4 yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the concentration was less than the RL listed in the QAPP, and therefore sample results were reported from this analysis. No qualification of the associated data was considered necessary.

The metals analyses in this SDG were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of samples, which were determined by the field pH determinations.

A volatile organic holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and is labeled HBW031.

Manual integration was employed in deriving results for the volatile and semi-volatile organics analyses in this SDG. The values that have been derived from manual integration are qualified by the laboratory on the quantitation reports and extracted ion current profiles are included in the SDG.

The nitroaromatics analysis of laboratory control samples W2LCS yielded a slightly low percent recovery (LCS=62%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time; therefore the laboratory applied the default range of 70-130%. Since the LCS recovery is less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

The pesticides/PCBs analysis of laboratory control samples N9LCS and N9LCSD yielded a slightly high percent recovery of the target compound Endrin (LCS=130%, LCSD=140%). The CLP method does not require the blank spike to be analyzed for the pesticides/PCBs, however, the laboratory did report these values along with their historical QC limits of Endrin (56-121%).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were problems noted with sample receipt. GOATHILLSPRINGS-T01N-GRW and GOATHILLSPRINGS-T01D-GRW were truncated to GOATHILESPRG-T01N-GRW and GOATHILLSPRG-T01D-GRW. The laboratory noted that GOATHILLSPRG-T01N-GRW and GOATHILLSPRG-T01D-GRW for cyanide analysis was received at an improper pH, which may have resulted in

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		possible loss of cyanide. The nondetect results were qualified as estimated (UJ). The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, orthophosphate, and the 28 day holding time was exceeded by less than twenty days for sulfate. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, beryllium, boron, copper, iron, molybdenum, sodium, and thallium were detected in various blanks. Table 1.2 summarizes the blank detections resulting in sample qualification and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKW9. TICs in method blanks are not considered to be reportable as TICs for samples and their identification as TICs was rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC • MS/MSD/PDS MMW-2-T01N-GRW MMW-2-D01N-GRW • LD MMW-2-T01N-GRW MMW-2-D01N-GRW	No	For matrix spike (MS) analysis on samples MMW-2-T01N-GRW, and MMW-2-D01N-GRW the recoveries of TKN, bicarbonate alkalinity, total alkalinity, copper and, cyanide were out of limits. Table 1.3 summarizes these MS results. The MS results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent samples were qualified.
Method QC • Surrogates • Serial Dilution MMW-2-T01N-GRW MMW-2D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses on samples MMW-2-T01N-GRW and MMW-2-D01N-GRW, both pH class A, (generally for trace ICP metals) was applicable for 1 out of 24 analytes. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-2-T01N-GRW, GOATHILLSPRG-T01N-GRW, GOATHILLSPRG-D01N-GRW, GOATHILLSPRG-T01D-GRW, and GOATHILLSPRG-D01D-GRW. Therefore, the molybdenum results for these samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For samples MMW-8A-T01N-GRW, MMW-1-T01N-GRW, GOATHILLSPRG-T01N-GRW, and GOATHILLSPRG-T01D-GRW the partial analysis of orthophosphate exceeded that of the total analysis of phosphorus. Similarly, the total analysis exceeded the dissolved analysis for copper in sample MW-9A-T01N/D01N-GRW. Table 1.4 summarizes these results and the data qualifications. For samples SPRING14-T01N/D01N-GRW, the anion/cation balance was outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary for AC Balance.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) GOATHILLSPRG-T01D-GRW GOATHILLSPRG-D01D-GRW • Rinsate Blank (RB) RB14T-SOL RB15T-SOL • Field Blank (FB) • Trip Blank (TB) TB87T-SOL TB18T-SOL	No	There were a few outlying %RPD values in the various field duplicates (FD). These are summarized in Table 1.5. The FD results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.6. The RB results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1. Also, page two of the Form 1 is missing in sample GOATHILLSPRG-T01N-GRW. The laboratory was contacted and the second page of the Form 1 was issued.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The semivolatile organic compounds (SVOC) analysis of laboratory control sample I2LCS yielded a slightly high percent recovery (LCS=99%) of the target compound 4-chloro-3-methylphenol. The CLP method does not require the blank spike to be analyzed for the SVOCs; however, the laboratory did report these values along with their historical QC limits of 4-chloro-3-methylphenol (23-97%). The blank spike in this analytical set actually indicates a greater accuracy than the historical QC limits. Therefore the accuracy of 4-chloro-3-methylphenol is considered acceptable; no qualifications are necessary. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration Table 1.7 and 1.8 summarizes initial and continuing calibration detections and the resultant data qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite as N	Orthophosphate	Sulfate
MMW-2-T01N-GRW	0.04 UJ	---	---	1760 J
MMW-3-T01N-GRW	0.04 UJ	0.005 UJ	0.011 J	1260 J
MMW-8A-T01N-GRW	0.04 UJ	0.005 UJ	31.6 J	1790 J
MW-1-T01N-GRW	0.92 J	---	---	744 J
MW-9A-T01N-GRW	0.93 J	0.005 UJ	0.030 J	537 J
GOATHILLSPRG-T01N-GRW	---	---	---	13600 J
GOATHILLSPRG-T01D-GRW	---	---	---	14300 J
MMW-8B-T01N-GRW	3.0 J	---	---	1600 J
SPRING14-T01N-GRW	0.46 J	0.005 UJ	0.077 J	205 J
RB14T-SOL	---	---	---	5.0 UJ
RB15T-SOL	---	---	---	5.0 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	3.0	2.7	2.5	2.5	1.26	0.30	MMW-3-T01N-GRW	U CCB-I U MB-I
Boron (P)	5.4	4.0 -6.0		42.2		2.7	MMW-3-T01N-GRW, MMW-3-D01N-GRW, MMW-8A-T01N-GRW, MMW-8A-D01N-GRW, MMW-8B-T01N-GRW, MMW-8B-D01N-GRW, MW-1-T01N-GRW, MW-1-D01N-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW, RB14T-SOL, RB15T-SOL,	J CCB-L UJ CCB-L U CCB-I
Beryllium (P)		1.4				0.2	MMW-3-T01N-GRW, MMW-3-D01N-GRW, MMW-8B-T01N-GRW, SPRING14-T01N-GRW, SPRING14-D01N-GRW	U CCB-I
Copper (P)			2.0		17.655	1.7	MMW-3-T01N-GRW, MMW-8B-D01N-GRW, MW-1-T01N-GRW, MW-1-D01N-GRW, MW-9A-D01N-GRW, RB14T-SOL	U CCB-I
Molybdenum (P)		-1.4	-1.1			1.1	GOATHILLSPRG-T01N-GRW, GOATHILLSPRG-D01N-GRW, GOATHILLSPRG-T01D-GRW, GOATHILLSPRG-D01D-GRW, MMW-2-T01N-GRW, MMW-2-D01N-GRW, MMW-3-T01N-GRW,	UJ CCB-L J CCB-L

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
							MMW-3-D01N-GRW, MMW-8A-T01N-GRW, MMW-8A-D01N-GRW, MMW-8B-T01N-GRW MMW-8B-D01N-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW, RB14T-SOL, RB15T-SOL	

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike and Post Digestion Spike Recovery Not Meeting Criteria

Sample/Analytes	Matrix Spike Recovery	Post Digestion Spike	Acceptance Limits	Action
MMW-2-T01N-GRW				
Bicarbonate Alkalinity	196.4%	NA	75-125%	Qualify parent sample J MS-H
Total Alkalinity	196.4%	NA		Qualify parent sample J MS-H
TKN	156.5%	NA		Qualify parent sample J MS-H
Cyanide	55.9%	NA		Qualify parent sample UJ MS-L
MMW-2-D01N-GRW				
Copper	73.3%	NA		Qualify parent sample UJ MS-L

Table 1.4
Total vs. Partial Qualifications for Metals and Inorganics

Sample/Analytes	Absolute difference	Higher RL	Action
MMW-8A-T01N-GRW • Orthophosphate vs. Phosphorus	31.5	0.5	Results for these analytes in the MMW-8A-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
MMW-1-T01N-GRW • Orthophosphate vs. Phosphorus	28.1	0.5	Results for these analytes in the MMW-1-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
GOATHILLSPRG-T01N-GRW • Orthophosphate vs. Phosphorus	17.9	1	Results for these analytes in the GOATHILLSPRG-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
GOATHILLSPRG-T01D-GRW • Orthophosphate vs. Phosphorus	14.6	1	Results for these analytes in the GOATHILLSPRG-T01D-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
SPRING14-T01N-GRW • Orthophosphate vs. Phosphorus	0.05	0.010	Results for these analytes in the SPRING14-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
MW-9A-T01N/D01N-GRW • Copper	4.0	1.7	Results for these analytes in the MW-9A-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
MMW-2-T01N-D01N-GRW • Nickel	150 208	1.5	Results for these analytes in the MMW-2-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.

Table 1.5
Field Duplicates Not Meeting Criteria

Sample/Analytes	RPD	RL (µg/l)	Evaluation Criteria	Action
GOATHILLSPRING-T01N/T01D-GRW				
TOC	> 2X RL	1	If both samples are > than 5x RL, precision is indicated by an RPD ≤30%. If both samples are < 5X RL, satisfactory precision is indicated if the absolute difference between the field duplicate results is < 2XRL.	These results were qualified as estimated in the parent samples (J FD-I).
TSS	RPD=46%	22.1		
Iron	RPD=31.3%	27.8		
Lead	RPD=36.5			

Table 1.6
Rinsate Blank Detections

Analytes	RB14T-SOL	RB15T-SOL
Ammonia (µg/l)	0.093	0.089
TKN (µg/l)	0.28	0.34
Phosphorus (µg/l)	0.091	---
Chloride (µg/l)	---	0.56
Aluminum (µg/l)	538	---
Barium (µg/l)	6.6	---
Lead (µg/l)	0.34	---
Manganese (µg/l)	15	---
Potassium (µg/l)	224	---
Zinc (µg/l)	52.6	42.8

Table 1.7
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC ICAL Date/Time	Analyte	RSDs >30%	Action	Qualification and Qualification Codes
12/03/02 (0900)	Acetone	37.2%	Results for this analyte in all samples associated with this calibration event were qualified as estimated.	J ICAL-I or UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.8
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
1/13/03 (0908)	Acetone 1,2-Dibromo-3-chloropropanee	-90.2% 28.1%	Results for these analytes in associated samples were qualified as estimated.	J CCAL-I or UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
1/14/03 (1156)	2-Chloron aphthalene 2,4-Dinitrophenol 4,6-Dinitro-2-methylphenol Pentachlorophenol	35.4% 55.9% 38.8% 34.3%	Results for these analytes in sample MMW-8A-T01N-GRW were qualified as estimated.	J CCAL-I or UJ CCAL-I
1/17/03 (0953)	2,4-Dinitrophenol 4,6-Dinitro-2-methylphenol Pentachlorophenol	54.6% 30.9% 34.9%	Results for these analytes in sample MMW-8B-T01N-GRW were qualified as estimated.	J CCAL-I or UJ CCAL-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT032 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brice Woodlock Date Completed: 3/25/03

Peer Reviewer: Alan Roberts Date Completed: 3/27/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
CAPULIN SPRING-T01N-GRW	SA	514225	CAPULINSG-T01N-GRW CAPULINSPRG-T01N-GRW	W	X	X					
CAPULIN SPRING-D01N-GRW	SA	514226	CAPULINSPRG-T01N-GRW	W	X						
RB02T-GRW	RB	514227		W	X	X	X	X	X		
RB02D-GRW	RB	514228		W	X						
MMW-47A-T01N-GRW	SA	514265	MMW47AT01	W	X	X	X	X	X		
MMW-47A-D01N-GRW	SA	514266		W	X						
EW-2-T01N-GRW	SA	514267		W	X	X					
EW-2-D01N-GRW	SA	514268		W	X						
EW-5B-T01N-GRW	SA	514269		W	X	X					
EW-5B-D01N-GRW	SA	514270		W	X						
LOWERSPRING13-T01N-GRW	SA	514271	LOWERSPRG13-T01N-GRW	W	X	X					
LOWERSPRING13-D01N-GRW	SA	514272	LOWERSPRG13-D01N-GRW	W	X						
SPRING13-T01N-GRW	SA	514273		W	X	X					
SPRING13-D01N-GRW	SA	514274		W	X						
MMW-23A-T01N-GRW	SA	514275		W	X	X					
MMW-23A-D01N-GRW	SA	514276		W	X						
MMW-23B-T01N-GRW	SA	514277		W	X	X					
MMW-23B-D01N-GRW	SA	514278		W	X						
EW-3-T01N-GRW	SA	514279		W	X	X					
EW-3-D01N-GRW	SA	514280		W	X						
TB94T-GRW	TB	514298		W			X				

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The samples in this delivery group were re-analyzed for Sulfate by method 375.4. These re-analyses were requested after the analytical holding time had expired. However, raw data from the original Sulfate analyses by method 300.0, which were performed within the holding time are provided in the data package. The results from the re-analyses are formally presented in this case submittal. Table 1.1 below summarizes the qualifications for sulfate holding times.

During the alkalinity analysis from 01/17/03, the continuing calibration blank sample designated CCB#3 yielded an alkalinity concentration that was marginally above the laboratory's reporting limit. However, this concentration was far less than the reporting limit listed in the project QAPP, and therefore the samples were reported from this analysis.

The metals analyses of the samples in this delivery group were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank has been included in the data package and is labeled as HBW032. The results were all nondetect, therefore there is no evidence of cross-contamination occurring during storage.

The nitroaromatics analyses of the blank spike samples associated with this delivery group yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded recoveries below the default control limits. The laboratory noted that at this time it has not established control charted control limits for this compound, therefore the default range of 70-130% was applied by the laboratory. The analyses of the matrix spikes associated with this SDG yielded very low recoveries for PYX. Since the recoveries are less than the lower limit but ≥10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The following problems with sample receipt were noted. • All samples listed on COC without –GRW at the end of their ID's had –GRW added as stated on container labels. • The laboratory noted that several samples for cyanide analysis were received at an improper pH, which may have resulted in possible loss of cyanide. The affected samples are CAPULINSPRG-T01N-GRW, LOWERSPRING13-T01N-GRW, and MMW-23A-T01N-GRW. CAPULINSPRG-T01N-GRW and LOWERSPRING13-T01N-GRW were cancelled (see next paragraph). MMW-23A-T01N-GRW was analyzed and the nondetect results were qualified as estimated (UJ). The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH. • Total cyanide analysis for samples CAPULINSPRG-T01N-GRW, SPRING13-T01N-GRW, and LOWERSPRG13-T01N-GRW was cancelled per the request of the client based on sample pH and replacement samples were submitted. LOWERSPRG13-T01N-GRW was mistakenly analyzed and the reported value was rejected (R).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Holding Times	No	The 48-hour holding times were exceeded by less than 48 hours for Nitrate as N, Nitrite as N, Orthophosphate, and the 28-day holding times for fluoride (exceeded by one day) and sulfate (exceeded by 15 days) were not met. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Several metals were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In all cases with a positive detection, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned. In all cases with a negative detection, results within 25% of the detection are qualified J/UJ. An indeterminate bias direction was assigned Several tentatively identified compounds were reported as present in the semivolatile blank SBLKW9. TICs in method blanks are not considered to be reportable as TICs for samples and their identification as TICs was rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC • MS/MSD/PDS CAPULINSPRG-T01N-GRW CAPULINSPRG-D01N-GRW MW-47A-T01N-GRW MW-47A-D01N-GRW • LD CAPULINSPRG-T01N-GRW CAPULINSPRG-D01N-GRW MMW-47A-T01N-GRW MMW-47A-D01N-GRW	No	The metals matrix and post digest spike recoveries that were out of control limits are summarized in Table 1.3a. The parent samples were qualified J/UJ. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The inorganics matrix and post digest spike recoveries that were out of control limits are summarized in Table 1.3b. The low alkalinity recoveries (2.8 %) were attributed to the highly acidic sample reacting with the matrix spike. Therefore, no alkalinity results were qualified based on MS recovery. The parent sample associated with the low recovery for Nitrite as Nitrogen (38.4 %) was qualified J/UJ. No recovery for Total Phosphorus resulted in rejection (R) of the parent sample result. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The matrix quality control results for the January 2003 groundwater and surface water sampling event will be evaluated collectively. Any additional data qualification issued will be discussed in the overall assessment for this sampling event.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution CAPULINSPRG-T01N-GRW CAPULINSPRG-D01N-GRW MMW-47A-T01N-GRW MMW-47A-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	Recoveries for internal standards Y and Sc was high for the ICPMS analysis of samples CAPULINSPRG-T01N-GRW, CAPULINSPRG-D01N-GRW, MMW-23A-T01N-GRW, and MMW-23A-D01N-GRW. Therefore, all molybdenum, barium, cadmium, and antimony results were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution analyses were conducted on pH class A samples CAPULINSPRG-T01N-GRW, CAPULINSPRG-T01N-GRW, MMW-47A-T01N-GRW and MMW-47A-D01N-GRW. The percent difference between the original result and result for the diluted sample for several analytes did not satisfy the <10% criterion. Seven of 24 serial dilutions were applicable and four of those were out of control limits for sample CAPULINSPRG-T01N-GRW. Five of 24 serial dilutions were applicable and two of those were out of control limits for sample CAPULINSPRG-D01N-GRW. One of 24 serial dilutions were applicable and none of those were out of control limits for sample MMW-47A-T01N-GRW. None of the 24 serial dilutions were applicable for sample MMW-47A-T01N-GRW. Table 1.4 summarizes these results and qualification for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The dissolved lead result was more than 30% greater than the total lead result for sample EW-2-T01N-GRW and EW-2-D01N-GRW. These results were qualified as estimated with an indeterminate bias (J TVP-I). For sample RB02T/D-GRW, the anion/cation balance percent difference was 22.41, outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary for AC Balance.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB02T-GRW RB02D-GRW • Field Blank (FB) • Trip Blank (TB) TB94T-GRW • Other (e.g., splits)	No	The FD results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The RB results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Table 1.5 summarizes the rinsate blank detections.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1. Also, on Form X for the metal instrument detection limits, it was noted that the detection limit was not listed for molybdenum. The laboratory was contacted and a corrected Form X was issued.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The LCS results for explosives were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial and continuing calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)
CAPULINSPRG-T01N-GRW	3.3 J			114 J	12900 J
MMW-47A-T01N-GRW					494 J
EW-2-T01N-GRW	0.83 J	0.005 UJ	0.017 J		110 J
EW-5B-T01N-GRW	0.40 UJ	0.005 UJ	0.093 J		859 J
LOWERSPRG13-T01N-GRW	0.40 UJ	0.005 UJ	0.023 J	15.6 J	1700 J
SPRING13-T01N-GRW	0.44 J	0.005 UJ	0.010 UJ	5.8 J	573 J
MMW-23A-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ	74.2 J	2350 J
MMW-23B-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ		289 J
EW-3-T01N-GRW	0.57 J	0.005 UJ	0.017	0.19 J	604 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Boron (P) 2/6/03	5.5	3.5	2.7	3.6	3.6	5.7	3.810	2.7	EW-2-T01N-GRW, EW-2-D01N-GRW, RB02T-GRW	U CCB, MB-I
Copper (P) 2/6/03				2.5	3.8	2.8		1.7	RB02T-GRW, RB02D-GRW	U CCB-I
Aluminium (P) 2/20/03 TJA ICAP 4			-3.8					14.2	EW-2-T01N-GRW, EW-2-D01N-GRW, EW-3-T01N-GRW, EW-3-D01N-GRW,	UJ CCB-L

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
									EW-5B-T01N-GRW, EW-5B-D01N-GRW, MW-23B-D01N-GRW	
Molybdenum (P) 2/20/03 TJA ICAP 4	2.0	2.2	2.7	1.9	3.2	2.1		1.1	LOWERSPRG13-T01N-GRW, SPRING13-TO1N-GRW	U CCB-I
Manganese (P) 2/20/03 TJA ICAP 4				0.8	1.8	0.7		0.5	RB02D-GRW	U CCB-I
Zinc (P) 2/20/03 TJA ICAP 4				4.3	10.6	5.3		3.9	MW-23B-T01N-GRW	U CCB-I
Aluminium (P) 2/20/03 TJA ICAP 5	29.0		31.6					22.6	MMW-47A-D01N-GRW	U CCB-I
Iron (P) 2/20/03 TJA ICAP 5	60.1							26.6	MMW-47A-T01N-GRW	U CCB-I
Arsenic (P) 2/27/03	-3.3	-2.4	-4.4	-3.3				2.3	MMW-47A-T01N-GRW, MMW-47A-D01N-GRW, CAPULINSPRG-D01N-GRW	UJ CCB-L
Molybdenum (P) 2/27/03		-1.3	-1.3	-1.5				1.1	MMW-47A-T01N-GRW, MMW-47A-D01N-GRW	UJ CCB-L
Boron (P) 2/28/03	9.0	5.9	7.2	4.2	6.0		3.257	2.7	CAPULINSPRG-T01N-GRW	U CCB-I
Zinc (P) 2/28/03		7.7						3.9	MMW-47A-T01N-GRW, MMW-47A-D01N-GRW	U CCB-I

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Detections Not Meeting Criteria

Sample/Analytes	Matrix Spike Recovery	Post Digestion Spike	Acceptance Limits	Action
CAPULINSPRING-T01N-GRW				
Antimony	58.0%	65.1%	75-125%	Qualify parent sample UJ/J MS, PDS-L
Barium	13.8%	64.8%		Qualify parent sample UJ/J MS, PDS-L
Boron	64.2%	69.7%		Qualify parent sample UJ/J MS, PDS-L
Molybdenum	39.7%	62.8%		Qualify parent sample UJ/J MS, PDS-L
Nitrite	38.4%	NA		Qualify parent sample UJ/J MS, PDS-L
Phosphorus	0.0%	NA		Qualify parent sample R MS-L

Sample/Analytes	Matrix Spike Recovery	Post Digestion Spike	Acceptance Limits	Action
CAPULINSPRING-D01N-GRW				
Antimony	51.2%	66.5%	75-125%	Qualify parent sample UJ/J MS, PDS-L
Barium	16.2%	67.0%		Qualify parent sample UJ/J MS, PDS-L
Boron	61.0%	71.1%		Qualify parent sample UJ/J MS, PDS-L
Molybdenum	40.7%	64.8%		Qualify parent sample UJ/J MS, PDS-L
MMW-47A-T01N-GRW				
Zinc	71.8%	NA	75-125%	Qualify parent sample UJ/J MS-L

Table 1.4
Serial Dilution Exceedances

Sample Analyte	% Difference
CAPULINSPRG-T01N-GRW	
Be	-47.2%
Mn	-10.1%
Ni	-16.8%
Zn	-15.2%
CAPULINSPRG-D01N-GRW	
Be	-50.8%
Zn	-11.4%

Table 1.5
Rinsate Blank Detections

Analytes	Sample	
	RB02T-GRW	RB02D-GRW
Total Dissolved Solids (mg/L)	23.0	---
Total Suspended Solids (mg/L)	0.60	---
Bicarbonate Alkalinity (mg/L)	2.0	---
Total Alkalinity (mg/L)	2.0	---
Total Kjeldahl Nitrogen (mg/L)	0.45	---
Orthophosphate (mg/L)	0.012	---
Aluminum (µg/l)	237	---
Boron (µg/l)	2.9	---
Cobalt (µg/l)	2.0	---
Copper (µg/l)	5.2	3.5
Manganese (µg/l)	102	32
Nickel (µg/l)	2.2	---

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT033 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 3/22/03

Peer Reviewer: Alan Roberts Date Completed: 3/26/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
MINE1-T01N-GRW	SA	514355	MINE1T01NGRW	W	X	X	X	X	X		
MINE1-D01N-GRW	SA	514356		W	X						
EW-5D-T01N-GRW	SA	514357		W	X	X					
EW-5D-D01N-GRW	SA	514358		W	X						
EW-6(MW-3)-T01N-GRW	SA	514359		W	X	X					
EW-6(MW-3)-D01N-GRW	SA	514360		W	X						
EW-6(MW-3)-T01D-GRW	FD	514361		W	X	X					
EW-6(MW-3)-D01D-GRW	FD	514362		W	X						
SPRING39-T01N-GRW	SA	514363		W	X	X					
SPRING39-D01N-GRW	SA	514364		W	X						
EW-4-T01N-GRW	SA	514365		W	X	X					
EW-4-D01N-GRW	SA	514366		W	X						
EW-5A-T01N-GRW	SA	514367		W	X	X					
EW-5A-D01N-GRW	SA	514368		W	X						
EW-1-T01N-GRW	SA	514369		W	X	X					
EW-1-D01N-GRW	SA	514370		W	X						
RB16T-SOL	RB	514371		W	X	X	X	X		X	
RB17T-SOL	RB	514372		W	X	X	X	X		X	
FB03T-SOL	FB	514373	FB03TSOL	W			X	X	X		
TB88-GRW	TB	514374		W			X				
TB98-GRW	TB	514375		W			X				
TB91-SOL	TB	514376		W			X				
TB89-SOL	TB	514377		W			X				
TB92-SOL	TB	514378		W			X				
TB93-SOL	TB	514379		W			X				

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The fluoride analysis of sample SPRING39-T01N-GRW was accomplished at a ten-fold dilution to reduce the interference from aluminum. No qualification of the associated data was considered necessary.

The samples in this sample delivery group (SDG) were re-analyzed for sulfate by method 375.4. The re-analysis was requested after the analytical holding time had expired. The raw data from the original sulfate analyses by method 300.0, which were performed within the holding time, are provided in the data package. The results from the re-analyses are formally presented in the case submittal. Table 1.1 below summarizes the qualification for sulfate holding time.

The metals analyses of the samples in this delivery group were performed at the dilution levels established by client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the filed pH determinations.

A volatile organic holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and is labeled HBW033.

Manual integration was employed in deriving results for the volatile and semi-volatile organics analyses in this SDG. The values that have been derived from manual integration are qualified by the laboratory on the quantitation reports and extracted ion current profiles are included in the SDG.

The nitroaromatics analysis of laboratory control sample yielded a slightly low percent recovery (LCS=62%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recovery is less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

The pesticide/PCB analysis of the closing continuing calibration check standard analyzed 1/15/03 at 1405 hours yielding decreased response for Decacachlorobiphenyl on the RTX-CLPII column, resulting in percent differences that exceeded control criteria. No qualification of the associated data was considered necessary.

The pesticides/PCB analysis of laboratory control sample yielded a slightly high percent recovery of the target compounds gamma-BHC (LCS=124%), Dieldrin (LCS=130%), Endrin (LCS=140%, and LSCD=140%), and 4,4'-DDT (LCS=130%). The CLP method does not require the blank spike to be analyzed for the pesticides/PCB, however, the laboratory did report these values along with their historical QC limit of gamma-BHC (56-123%), Dieldrin (52-126%), Endrin (56-121%), and 4,4'DDT (38-127%). Therefore, no qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were problems noted with sample receipt. • Sample collections times for samples EW-4-T01N-GRW and EW-5A-T01N-GRW were inadvertently not marked on the COC. The laboratory was contacted and the collections times were taken from the container labels.
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, orthophosphate, and the 28 day holding time was exceeded by less than fifteen days for sulfate. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, arsenic, boron, manganese, molybdenum, diethylphthalate, and bis (2-ethylhexyl) phthalate were detected in various blanks. Table 1.2 summarizes the blank detections resulting in sample qualification and the resultant data qualifications. In all cases, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKW9. TICs in method blanks are not considered to be reportable as TICs for samples and their identification as TICs was rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC • MS/MSD/PDS EW-1-T01N-GRW EW-1-D01N-GRW • LD EW-1-T01N-GRW EW-1-D01N-GRW	No	For matrix spike analysis on samples EW-1-T01N-GRW and EW-1-D01N-GRW the recovery of aluminum was low. Table 1.3 summarizes these matrix spike results. The matrix spike results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent samples were qualified on the basis of MS results per SOP 12.1 The recovery for aluminum in the post digestion spike EW-1-T01N-GRW and EW-1-D01N-GRW was low. Table 1.3 summarizes these post digestion spike results. The post digestion spike results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent samples were qualified on the basis of PDS results per SOP 12.1.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	This serial dilution analyses were conducted on samples EW-1-T01N-GRW and EW-1-D01N-GRW. The serial dilution is not applicable since the results for magnesium was less than 50x the IDL, adjusted for dilution. The laboratory indicated that magnesium had a percent difference between the original and diluted results of greater than 10%. No results failed to meet the acceptance criteria. For sample EW-6 (MW-3)-T01D-GRW the partial analysis of orthophosphate exceeded that of the total analysis of phosphorus did not meet acceptance criteria. Table 1.4 summarizes these results and the data qualifications. For sample SPRING39-T01N/D01N-GRW, the anion/cation balance was 30.8%, outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary for AC Balance.
Field QC • Field Duplicate (FD) EW-6 (MW-3)-T01N-GRW EW-6 (MW-3)-D01N-GRW • Rinsate Blank (RB) RB16T-SOL RB17T-SOL • Field Blank (FB)	No	There were a few detections in the various field duplicates (FD). These are summarized in Table 1.5. The FD results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.6. The RB results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
FB03T-SOL • Trip Blank (TB) TB88-GRW TB98-SOL TB91-SOL TB89-SOL TB92-SOL TB93-SOL • Other (e.g., splits)		There were a few detections in the various field blanks (FB). These are summarized in Table 1.7. The FB results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The LCS results for explosives were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs/Pesticides: Initial and Continuing Calibration These are summarized in Table 1.8 and 1.9.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Sulfate (mg/L)
MINE1-T01N-GRW	0.82 J	0.011 J	0.013 J	1650 J
EW-5D-T01N-GRW	0.40 J	0.005 UJ	0.021 J	1090 J
EW-6 (MW-3)-T01N-GRW	0.59 J	0.005 UJ	0.027 J	738 J
EW-6 (MW-3)-T01D-GRW	0.58 J	0.005 UJ	0.027 J	691 J
SPRING39-T01N-GRW	0.47 J	0.005 UJ	0.016 J	49.9 J
EW-4-T01N-GRW	0.51 J	0.005 UJ	0.034 J	525 J
EW-5A-T01N-GRW	0.40 J	0.005 UJ	0.11 J	980 J
EW-1-T01N-GRW	0.79 J	0.005 UJ	0.012 J	207 J
RB15T-SOL	0.40 UJ	---	---	5.0 UJ
RB17T-SOL	0.40 UJ	---	---	5.0 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminium (P)	-43.7	-51.9	-47.6	-48.1	-54.2	-29.46	14.2	EW-1-T01N-GRW, EW-1-D01N-GRW, EW-4-T01N-GRW, EW-4-D01N-GRW, EW-5A-T01N-GRW, EW-5A-D01N-GRW, EW-5D-T01N-GRW, EW-5D-D01N-GRW, EW-6 (MW-3)-T01N-GRW, EW-6 (MW-3)-D01N-GRW, EW-6 (MW-3)-T01D-GRW, EW-6 (MW-3)-D01D-GRW, MINE1-D01N-GRW, RB16T-SOL, RB17T-SOL	UJ CCB-L J CCB-L UJ MB-L J MB-L
Antimony (MS)	0.4	0.6	0.7	0.9	1.0		0.30	MINE1-T01N-GRW	U CCB-I
Boron (P)	6.6 3.2				5.0	4.096	2.7	EW-1-T01N-GRW, EW-1-D01N-GRW, EW-4-T01N-GRW, EW-4-D01N-GRW, EW-5D-T01N-GRW, EW-5D-D01N-GRW, MINE1-T01N-GRW, MINE1-D01N-GRW,	U CCB-I U MB-I
Molybdenum (P)	-1.8	-1.7	-2.4	-2.9	-2.5		1.1	EW-1-D01N-GRW, EW-5D-T01N-GRW, EW-5D-D01N-GRW, EW-6 (MW-3)-T01N-GRW, EW-6 (MW-3)-D01N-GRW, EW-6 (MW-3)-T01D-GRW, EW-6 (MW-3)-D01D-GRW, RB16T-SOL, RB17T-SOL	UJ CCB-L J CCB-L
Diethylphthalate						2	11	FB03T-SOL	U MB-I
Bis (2-ethylhexyl) phthalate								RB16T-SOL, RB17T-SOL	U MB-I

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Recovery Not Meeting Criteria for Metals

Sample/Analytes	Matrix Spike Recovery	Post Digestion Spike Recovery	Acceptance Limits	Action
EW-1-T01N-GRW				
Aluminum	72.6%	73.6%	75-125%	Qualify parent sample J MS-L
EW-1-D01N-GRW				
Aluminum	73.0%	71.8%	75-125%	Qualify parent sample J MS-L

Table 1.4
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Absolute difference	RL	Action
EW-6 (MW-3)-T01D-GRW • Orthophosphate Vs. Phosphorus	0.236	0.010	Results for these analytes in the EW-6 (MW-3)-T01D-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.

Table 1.5
Comparison of Positive Field Duplicates

Analytes	EW-6 (MW-3)-T01N-GRW (µg/l)	EW-6 (MW-3)-T01D-GRW (µg/l)	CRDL with Dilution Factor	RPD/Absolute Difference	Action
TSS	3.5	0.9	RL= 0.5	5.2x RL	J FD-I for parent and duplicate sample
Orthophosphate	0.027	0.27	RL= 0.01	24.3x RL	J FD-I for parent and duplicate sample

Table 1.6
Positive Results for Rinsate Blanks

Analyte	RB16T-SOL	RB17T-SOL
Ammonia (mg/L)	0.091	0.085
Methylene Chloride (µg/l)	0.9	---
Bis (2-ethylhexyl) phthalate (µg/l)	1	0.7

Table 1.7
Positive Results for Field Blanks

Analyte	FB03T-SOL
Methylene Chloride (µg/l)	2
Bis (2-ethylhexyl) phthalate (µg/l)	0.6

Table 1.8
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC ICAL Date/Time	Analyte	RSDs >30%	Action	Qualification and Qualification Codes
12/03/02 (0900)	Acetone	37.2%	Results for this analyte in all samples assocaited with this calbiration event were qualified as estimated.	J ICAL-I or UJ ICAL-I
SVOC ICAL Date/Time	**Analyte**	**RSDs >30%**	**Action**	**Qualification and Qualification Codes**
01/06/03 (0921)	Benzaldehyde	39.3%	Results for this analyte in all samples assocaited with this calbiration event were qualified as estimated.	J ICAL-I or UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.9
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
1/13/03 (0908)	Acetone 1,2-Dibromo-3-chloropropane	-90.2% 28.1%	Results for these analytes in associated samples were qualified as estimated.	J CCAL-I or UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
1/16/03 (0617)	Benzaldehyde 3,3'-Dichlorobenzidine Di-n-octylphthalate	46.8% 25.8% -60.8%	Results for these analytes in associated samples were qualified as estimated.	J CCAL-I or UJ CCAL-I
PCB/Pesticide CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
1/15/03 (1341)	Decachlorobiphenyl	-35.0%	Results for these analytes were not reported; therefore no qualification was necessary.	NONE

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT034 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 3/21/03

Peer Reviewer: Stacey Coker Date Completed: 3/26/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RB06T-GRW	RB	514457		W	X	X					
RB06D-GRW	RB	514458		W	X						
MMW-24-T01N-GRW	SA	514459	MMW24T01NGRW	W	X	X		X			
MMW-24-D01N-GRW	SA	514460		W	X						
RB05T-GRW	RB	514461		W	X	X					
RB05D-GRW	RB	514462		W	X						
MW-14-T01N-GRW	SA	514463		W	X	X					
MW-14-D01N-GRW	SA	514464		W	X						
MMW-7-T01N-GRW	SA	514465	MMW7T01N-GRW	W	X	X	X	X	X		
MMW-7-D01N-GRW	SA	514466		W	X						
TB95-GRW	TB	515467		W			X				
MW-10-T01N-GRW	SA	514468		W	X	X					
MW-10-D01N-GRW	SA	514469		W	X						
MW-17B-T01N-GRW	SA	514470		W	X	X					
MW-17B-D01N-GRW	SA	514471		W	X						
TB113-SOL	TB	514472		W	X						
RB18T-SOL	RB	514473		W	X	X	X	X		X	
TB90-SOL	TB	514474		W			X				
TB99-SOL	TB	514475		W			X				
TB96-SOL	TB	514476		W			X				
TB97-SOL	TB	514477		W			X				
TB102-SOL	TB	514478		W			X				
MMW-40A-T01N-GRW	SA	514679	MMW40AT01NGR	W	X	X	X	X	X		
MMW-40A-D01N-GRW	SA	514680		W	X						
MMW-35B-T01N-GRW	SA	514681	MM35BT01NGR	W	X	X	X	X	X		
MMW-35B-D01N-GRW	SA	514682		W	X						
TB25T-GRW	TB	514683		W			X				

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The samples in this sample delivery group (SDG) were re-analyzed for sulfate by method 375.4. The re-analysis was requested after the analytical holding time had expired. The raw data from the original sulfate analyses by method 300.0, which were performed within the holding time, are provided in the data package. The results from the re-analyses are formally presented in the case submittal. Table 1.1 below summarizes the qualification for sulfate holding time.

During the alkalinity analysis of the samples in this SDG, the associated blank samples CCB2, CCB3, and CCB4 yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the concentration was less than the RL listed in the QAPP, and therefore sample results were reported from this analysis. No qualification of the associated data was considered necessary.

The metals analyses of the samples in this delivery group were performed at the dilution levels established by client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the filed pH determinations

A volatile organic holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and is labeled HBW034.

Manual integration was employed in deriving results for the volatile and semi-volatile organics analyses in this SDG. The values that have been derived from manual integration are qualified by the laboratory on the quantitation reports and extracted ion current profiles are included in the SDG.

The nitroaromatics analysis of laboratory blank spikes yielded a slightly low percent recoveries (W2LCS=62% and X3LCS=50%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

The pesticide/PCB analysis of the closing continuing calibration check standard analyzed 1/15/03 at 1405 hours yielding decreased response for Decachlorobiphenyl on the RTX-CLPII column, resulting in percent differences that exceeded control criteria. While the continuing calibration in this analytical set included Decachlorobiphenyl the actual samples only reported the PCB analytes; therefore no qualifications are necessary for Decachlorobiphenyl.

The pesticides/PCB analysis of laboratory control samples O6LCSD yielded a slightly high percent recovery of the target compound Endrin (LCS=140%). The CLP method does not require the blank spike to be analyzed for the pesticides/PCB, however, the laboratory did report these values along with the historical QC limit for Endrin (56-121%). While the blank spike in this analytical set included Endrin the actual samples only reported the PCB analytes; therefore no qualifications are necessary for Endrin.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were problems noted with sample receipt. • Sample MW-10-T01N-GRW was inadvertently marked on the Total Organic Compounds (TOC) vials as RB05T-GRW. The laboratory was contacted and the correction was made so that this sample was logged in with correct ID.
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, orthophosphate, and the 28 day holding time wasexceeded by less than fourteen days for sulfate. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Antimony, boron, molybdenum, 1,2,4-trichlorobenzene, diethylphthalate, di-n-butylphthalate, bis (2-ethylhexyl)phthalate were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In all cases, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKW9. TICs in method blanks are not considered to be reportable as TICs for samples and their identification as TICs was rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RB • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution test was conducted on a rinsate blank sample. As such, the results can not be used to assess potential interferences on the site-specific sample matrix. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-24-T01N-GRW, MMW-24-D01N-GRW, MMW-7-T01N-GRW, MMW-7-D01N-GRW, MW-17B-T01N-GRW, and MW-17B-D01N-GRW. Therefore, all molybdenum results were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For samples RB05T-GRW, and MW-14-T01N-GRW the partial analysis of orthophosphate exceeded that of the total analysis of phosphorus did not meet acceptance criteria. Table 1.6 summarizes these results and the data qualifications. For sample RB06T/D-GRW, the anion/cation balance was 17.6%, outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary on the basis of the charge balance.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB06T-GRW RB06D-GRW RB05T-GRW RB05D-GRW RB18T-GRW • Field Blank (FB) • Trip Blank (TB) TB95-GRW TB173-SOL TB90-SOL TB99-SOL TB96-SOL TB102-SOL TB25T-GRW • Other (e.g., splits)	No	There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.4. The RB results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The semivolatile analysis of laboratory blank spikes yielded slightly high percent recoveries of the target compounds 4-Nitrophenol (J7LCS=99%, K2LCS=93%, and K2LCSD=103%), and Pentachlorophenol (J7LCS=105%, K2LCS=108%, and K2LCSD=109%). The CLP method does not require the blank spike to be analyzed for the semivolatile organic compounds, however, the laboratory did report these values along with their historical QC limits for 4-Nitrophenol (10-80%), and Pentachlorophenol (9-103%). The blank spikes in this analytical set indicate a greater accuracy than the historical QC limits. Recoveries of 4-Nitrophenol (99%, 93%, and 109%), and Pentachlorophenol (105% 108%, and 109%) are considered acceptable; therefore no qualifications are necessary. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial and continuing calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		• Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Sulfate (mg/L)
RB06T-GRW	0.52 J	0.005 UJ	0.01 UJ	5.0 UJ
MMW-24-T01N-GRW	29.9 J	0.005 UJ	0.010 UJ	1710 J
MMW-7-T01N-GRW	0.40 UJ	0.005 UJ	16.3 J	6680 J
MW-10-T01N-GRW	0.64 J	0.005 UJ	0.025 J	37.3 J
MW-17B-T01N-GRW	0.41 J	0.005 UJ	0.012 J	413 J
MMW-40A-T01N-GRW	2.1 J	0.005 UJ	0.11 J	560 J
MMW-35B-T01N-GRW	0.040 UJ	0.005 UJ	0.010 J	1540 J
RB05T-GW	---	---	---	5.0 UJ
MW-14-T01N-GRW	---	---	---	362 J
RB18T-SOL	---	---	---	5.0 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	1.4	1.2	1.2	1.2	4.28	0.3	MMW-35B-T01N-GRW, MMW-35B-D01N-GRW, MMW-40A-D01N-GRW, MW-14-T01N-GRW, RB06T-GRW	U CCB-I U MB-I
Boron (P)	5.7 8.1	3.4 5.2	4.1	4.3 5.8	5.733	2.7	MMW-24-T01N-GRW, MMW-35B-T01N-GRW, MMW-35B-D01N-GRW, MMW-40A-T01N-GRW, MMW-40A-D01N-GRW, MW-10-T01N-GRW, MW-10-D01N-GRW, MW-14-T01N-GRW, MW-14-D01N-GRW, RB06T-GRW	U CCB-I U MB-I
Molybdenum (P)				1.7	1.376	1.1	MW-10-T01N-GRW, MW-10-D01N-GRW, MW-14-T01N-GRW, MW-14-D01N-GRW, RB06T-GRW	U MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Diethylphthalate					2 0.5	11	MMW-40A-T01N-GRW, MMW-7-T01N-GRW	U MB-I

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Absolute difference	RL	Action
RB05T-GRW • Orthophosphate Vs. Phosphorus	4.39	0.5	Results for these analytes in the RB05T-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
MW-14-T01N-GRW • Orthophosphate Vs. Phosphorus	0.052	0.022	Results for these analytes in the MW-14-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.

Table 1.4
Positive Reuslts for Rinsate Blanks

Analyte	RB06T-GRW	RB06D-GRW	RB05T-GRW	RB05D-GRW	RB018T-SOL
TDS (mg/L)	---	---	46	---	---
Bicarbonate Alkalinity (mg/L)	2.7	---	2.5	---	---
Total Alkalinity (mg/L)	2.7	---	2.5	---	---
Ammonia (mg/L)	0.052	---	0.078	---	0.056
Nitrate (mg/L)	0.52	---	---	---	---
Phosphate (mg/L)	---	0.036	---	---	---
Orthophosphate (mg/L)	---	---	4.4	---	---
Copper (µg/l)	---	---	2.8	1.8	---
Chloroform (µg/l)	---	---	---	---	6

Table 1.5
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC ICAL Date/Time	Analyte	RSDs >30%	Action	Qualification and Qualification Codes
12/03/02 (0900)	Acetone	37.2%	Results for this analyte samples MMW-7-T01N-GRW, TB95-GRW, TB113-SOL, RB18T-SOL, TB90-SOL, TB99-SOL, TB96-SOL, TB97-SOL, and TB102-SOLwith this calibration event were qualified as estimated.	J ICAL-I or UJ ICAL-I
VOC ICAL Date/Time	**Analyte**	**RSDs >30%**	**Action**	**Qualification and Qualification Codes**
01/06/03 (0921)	Benzaldehyde	39.3%	Results for this analyte in all samples associated with this calibration event were qualified as estimated.	J ICAL-I or UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.6
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
1/13/03 (2055)	1,2-Dibromo-3-chloropropane	28.1%	Results for this analyte samples MMW-7-T01N-GRW, TB95-GRW, TB113-SOL, RB18T-SOL, TB90-SOL, TB99-SOL, TB96-SOL, TB97-SOL, and TB102-SOLwith this calibration event were qualified as estimated.	J CCAL-I or UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
1/16/03 (0617)	Benzaldehyde 3,3'-Dichlorobenzidine Di-n-octylphthalate	46.8% 25.8% -60.8%	Results for samples MMW-7-T01N-GRW, and RB18T-SOL were qualified as estimated.	J CCAL-I or UJ CCAL-I
1/20/03 (0940)	2,4-Dinitrophenol 4-Nitrophenol Di-n-octylphthalate	-30.6% -27.3% -45.0%	Results for sample MMW-35B-T01N-GRW were qualified as estimated.	J CCAL-I or UJ CCAL-I
1/21/03 (0724)	Benzaldehyde Di-n-octylphthalate	-99.9% -44.9%	Results for samples MMW-40A-T01N-GRW were qualified as estimated.	J CCAL-I or UJ CCAL-I
PCB/Pesticide CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
1/15/03 (1341)	Decachlorobiphenyl	-35.0%	Results for these analytes were not reported; therefore no qualification was necessary.	NONE
Explosives CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
01/23/03 (0109)	2,4-Diamino-6-nitrotoluene	20.0%	Results for these analytes were not reported; therefore no qualification was necessary.	NONE
01/23/03 (0912)	2,4-Diamino-6-nitrotoluene 2,6-Dinitrotoluene	25.0% 20.0%	Results for these analytes were not reported; therefore no qualification was necessary.	NONE

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT035 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brice Woodlock Date Completed: 3/13/03

Peer Reviewer: Stacey Coker Date Completed: 3/24/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
TB103-GRW	TB	514691		W			X				
LABWELL-T01N-GRW	SA	514692		W	X	X	X	X			
LABWELL-D01N-GRW	SA	514693		W	X						
COLUMBINE2-T01N-GRW	SA	514694	COL2-T01N-GRW COL2T01NG	W	X	X	X	X	X		
COLUMBINE2-D01N-GRW	SA	514695	COL2-D01N-GRW	W	X						
TB107	TB	514696		W			X				
MW17-T01N-GRW	SA	514697		W	X	X	X	X			
MW17-D01N-GRW	SA	514698		W	X						
MMW-42B-T01N-GRW	SA	514699		W	X	X					
MMW-42B-D01N-GRW	SA	514700		W	X						
MMW-31A-T01N-GRW	SA	514701	MMW31AT01NGR	W	X	X			X		
MMW-31A-D01N-GRW	SA	514702		W	X						
MMW-42A-T01N-GRW	SA	514703		W	X	X					
MMW-42A-D01N-GRW	SA	514704		W	X						
TB110-GRW	TB	514705		W			X				
MMW-28A-T01N-GRW	SA	514706	MMW28AT01NGR	W	X	X	X	X	X		
MMW-28A-D01N-GRW	SA	514707		W	X						
MMW-28B-T01N-GRW	SA	514708	MMW28BT01NGR	W	X	X	X	X	X		
MMW-28B-D01N-GRW	SA	514709		W	X						
SPRING12-T01N-GRW	SA	514710		W	X	X					
SPRING12-D01N-GRW	SA	514711		W	X						
SPRING18-T01N-GRW	SA	514712		W	X	X					
SPRING18-D01N-GRW	SA	514713		W	X						

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The original Total Dissolved Solids (TDS) analysis of sample SPRING12-T01N-GRW, which was performed within holding time, yielded a net weight after drying that greatly exceeded the upper limit of the method. This sample was re-analyzed using a smaller sample volume outside of holding time yielding results comparable to the original analysis. The result from the re-analysis has been formally presented in this case submittal, with the data from the original analysis being presented in the raw data section of the data package. The result was qualified for hold time as estimated (J/UJ) with an indeterminate bias.

Per the client's request, the samples in this delivery group were re-analyzed for Sulfate by method 375.4. The re-analyses were requested after the analytical holding time had expired. However, raw data from the original Sulfate analyses by method 300.0, which were performed within the holding time are provided in the data package. The results from the re-analyses are formally presented in the submittal. The results from the re-analysis, which was selected for reporting, was qualified as estimated on the basis of the holding time.

The metals analyses of the samples in this delivery group were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

The ICP/MS metals analyses of select samples in this delivery group yielded percent recoveries of the internal standard scandium that marginally exceeded control criteria. This internal standard is associated with the target elements selenium and vanadium, which were reported from the ICP/MS. Resultant data qualification is discussed in the table below.

A volatile holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank has been included in the data package and is labeled as HBW035. The results were all nondetect, therefore there is no evidence of cross-contamination occurring during storage.

The volatile organics analysis of sample TB103-GRW yielded a percent recovery of the surrogate monitoring compound 1,2-dichloroethane-d4 that marginally exceeded control criteria. The laboratory noted that no target analytes were detected in this sample above the reporting limit.

Manual integration was employed in deriving results for the volatile organics and semivolatile organics analyses in this delivery group. The values that have been derived from manual integration are qualified on the quantitation reports and extracted ion current profiles are included in the data package.

The nitroaromatics analyses of the blank spike samples associated with this delivery group yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded recoveries below the default control limits. The laboratory noted that at this time it has not established control charted control limits for this compound, therefore the default range of 70-130% was applied by the laboratory. The analyses of the matrix spikes associated with this SDG yielded very low recoveries for PYX. Since the recoveries are less than the lower limit but ≥10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The following problems with sample receipt were noted. • MW-17 was misinterpreted from the COC as MW-47 and the resultant hard copy and EDD were hand corrected to read MW-17 as intended.. • Samples MMW-42B-T01N-GRW and MMW-42B-D01N-GRW were missing the –GRW suffix on the COC. All container labels had the matrix code suffix and the samples were logged-in according tot he sample labels. • One explosives bottle was received broken for sample MMW-28B-T01N-GRW and one VOA vial was received broken for sample LABWELL-T01N-GRW. The laboratory was able to conduct the requested analyses with the remaining sample volume. • Upon log-in at the laboratory, the field ID, "COLUMBINE2-T01N-GRW" was truncated to "COL2-T01N-GRW". • The laboratory noted that several samples for cyanide analysis were received at an improper pH, which may have resulted in possible loss of cyanide. The affected samples are MMW-42B-T01N-GRW, MMW-31A-T01N-GRW, and MMW-42A-T01N-GRW. The nondetect results were qualified as estimated (UJ). The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	The 48-hour holding time for nitrate as N, nitrite as N, orthophosphate were exceeded by less than two days for all samples. The 28 day hold time for sulfate was exceeded by 15 days for all samples. The associated bias direction for these results qualified as estimated (J/UJ) on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Mercury and antimony were detected in various blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications. In all cases, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKW9. TICs in method blanks are not considered to be reportable as TICs for samples and their identification as TICs was rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC • MS/MSD/PDS COL2-T01N-GRW COL2-D01N-GRW • LD COL2-T01N-GRW	No	All matrix spike recoveries were within evaluation criteria, therefore, no qualifications of data were necessary. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution COL2-T01N-GRW COL2-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery for the VOC analyses was high in TB103-GRW. The recovery of the surrogate 1,2-dichloroethane-d4 was 117%. This recovery is slightly above the acceptance range of 87%-114%, suggesting a potential high bias in the associated sample results. All analytes were non-detect, therefore, no qualification was necessary based on VOC surrogate recoveries. The recovery of one of the eight SVOC surrogates was high in one sample, COL2-T01N-GRW. The recovery of the surrogate phenol-d5 was 112%. This recovery is slightly above the acceptance range of 10%-110%, suggesting a potential high bias in the associated sample results. Because only one surrogate recovery was out of control limits, data qualification was not necessary. The serial dilution analyses were conducted on pH class A samples COL2-T01N-GRW (generally for ICP/MS metals) and COL2-D01N-GRW (generally for ICP metals). The percent difference between the original result and result for the diluted sample for all applicable analytes did satisfy the <10% criterion. One analyte in 24 was applicable in both samples. Recovery for internal standard Y was high for the ICPMS analysis of samples COL2-T01N-GRW, COL2-D01N-GRW, MMW-31A-T01N-GRW, MMW-31A-D01N-GRW, MMW-42A-T01N-GRW, and MMW-42A-D01N-GRW. Therefore, all molybdenum results were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Sc was high for the ICPMS analysis of samples MMW-28A-T01N-GRW, MMW-28B-T01N-GRW, SPRING12-T01N-GRW, SPRING12-D01N-GRW, SPRING18-T01N, and SPRING18-D01N-GRW. Therefore, all aluminum, boron, chromium, and zinc results were reported by trace ICP. Selenium and vanadium were reported from ICPMS and the associated results are qualified as estimated J/UJ with an indeterminent bias. The orthophosphate result was greater than the total phosphate result for samples LABWELL-T01N-GRW, MW-17-T01N-GRW, MMW-42A-T01N-GRW, MMW-28A-T01N-GRW, MMW-28B-T01N-GRW, SPRING12-T01N-GRW, and SPRING18-T01N-GRW. Table 1.2 summarizes these results and the resultant data qualifications. In calculating the charge balances, it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit for samples LABWELL-T01N/D01N-GRW, MW-17-T01N/D01N, MMW-28A-T01N/D01N-GRW, and MMW-28B-T01N/D01N-GRW. Upon reviewing the cation and anion results, and comparison to historical data it was determined that the measured TDS result is biased high as summarized in Table 1.3. Thus, only the measured TDS results for these samples were qualified as estimated (J).
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1. Also, on Form X for the metal instrument detection limits, it was noted that the detection limit was not listed for molybdenum. The laboratory was contacted and a corrected Form X was issued.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The LCS results for explosives were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial and continuing calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	1.0	0.8	0.8	0.8		0.20	LABWELL-T01N-GRW	U CCB-I
Mercury (CV)					0.150	0.1	MMW-31A-T01N-GRW	U MB-I

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Total vs. Partial Qualifications for Inorganics

Sample	Total Phosphorus (mg/L)	Orthophosphate (mg/L)	RL (mg/L)	Qualification
LABWELL-T01N-GRW	0.010 U	0.13	0.01	TvP-I
MW-17-T01N-GRW	0.017	0.072	0.01	TvP-I
MMW-42A-T01N-GRW	0.033	12.9	0.25	TvP-I
MMW-28A-T01N-GRW	0.010 U	14.1	1.0	TvP-I
MMW-28B-T01N-GRW	0.019	1.7	0.25	TvP-I
SPRING12-T01N-GRW	0.010 U	0.085	0.01	TvP-I
SPRING18-T01N-GRW	0.010 U	6.7	1.0	TvP-I

U = Not detected at associated reporting limit.

Table 1.3
Total versus Partial Summary

Sample	Historical TDS Measured Data			TDS Measured	TDS Calculated	Qualification
LABWELL-T01N-GRW	180	181	- -	2210	232	TvP-H
MW-17-T01N-GRW	510	506	494	3260	558	TvP-H
MMW-28A-T01N-GRW	695	570	710	3610	653	TvP-H
MMW-28B-T01N-GRW	730	690	760	3610	728	TvP-H

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT036 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 03/07/03

Peer Reviewer: Alan Roberts/Stacey Coker Date Completed: 03/25/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
P-1-T01N-GRW	SA	514736		W	X	X	X	X	X		
P-1-D01N-GRW	SA	514737		W	X						
P-1-T01D-GRW	FD	514738		W	X	X	X	X	X		
P-1-D01D-GRW	FD	514739		W	X						
MMW-22-T01N-GRW	SA	514740	MMW22T01NGRW	W	X	X	X	X	X		
MMW-22-DO1N-GRW	SA	514741		W	X						
OUTFALL002-T01N-GRW	SA	514742		W	X	X					
OUTFALL002-D01N-GRW	SA	514743		W	X						
MW-13-T01N-GRW	SA	514744		W	X	X					
MW-13-D01N-GRW	SA	514745		W	X						
LS3-T01N-GRW	SA	514746		W	X	X					
LS3-D01N-GRW	SA	514747		W	X						
LS3-T01D-GRW	FD	514748		W	X	X					
LS3-D01D-GRW	FD	514749		W	X						
US-1-T01N-GRW	SA	514750		W	X	X					
US-1-D01N-GRW	SA	514751		W	X						
LS-1-T01N-GRW	SA	514752		W	X	X					
LS-1-D01N-GRW	SA	514753		W	X						
P-2-T01D-GRW	FD	514754		W	X	X	X	X	X		
P-2-D01D-GRW	FD	514755		W	X						
TB100-GRW	TB	514756		W			X				

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The original Total Dissolved Solids (TDS) analyses, which were performed within the holding time limit, yielded a net weight after drying that greatly exceeded the upper limit of the method for some samples. The affected samples were re-analyzed using a smaller sample volume. The re-analyses were conducted outside of the holding time. The results for the re-analyses were comparable to the original analyses. The results from the re-analyses have been formally reported in the case submittal. Table 1.1 below summarizes the qualification for TDS holding time.

As requested, the samples in this delivery group were re-analyzed for sulfate by method 375.4. This re-analysis occurred after the holding time had expired. Raw data from the original sulfate analyses (method 300.0) were performed within the holding time and presented in the data package. The results for the re-analyses were formally presented in this data package. Qualifications based on sulfate holding time exceedances are described in Table 1.1.

The metals analyses in this sample data group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile organic holding blank was carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and labeled HBW036. All results for HBW036 were nondetect, as such, it is unlikely that any cross-contamination resulted from sample storage.

Manual integration was employed in deriving results for the volatile and semi-volatile organics analyses in this SDG. The values that have been derived from manual integration are qualified on the quantitation reports and extracted ion current profiles are included in the SDG.

The laboratory case narrative noted the blank spike sample X3LCS, for nitroaromatic analysis, yielded a slightly low percent recovery (50%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J), with a low bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, sample MMW-22-T01N-GRW for cyanide analysis was received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect results were qualified as estimated (UJ), with an indeterminate bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Holding Times	No	Several samples in this delivery group were received outside or at the end of the prescribed analytical holding time of 48 hours from the date of sample collection for the nitrite, orthophosphate, and nitrate analyses. Several nitrite, orthophosphate, and nitrate results were less than 48 hours outside the holding time and were therefor qualified as estimated (J/UJ). Several samples for total dissolved solids (TDS) analyses and all samples for sulfate analyses were accomplished beyond their prescribed analytical holding time of 7 and 28 days by 11 days and 14 -15days repectively. As a result, the affected sample results were qualified as estimated (J/UJ). Table 1.1 summarizes the holding time exceedances and the resultant data qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In all cases, the result was qualified as nondetect at the reported value.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution P-1-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery for the explosive analysis was low in sample P-1-T01D-GRW. The recovery of 1,2-dinitrobenzene was 83%. This recovery is outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Because the surrogate recovery is lower than the acceptance limit but greater than 10%, all explosive results for sample P-1-T01D-GRW were qualified as estimated (UJ). The serial dilution analysis on sample P-1-T01N-GRW, was not applicable for 23 of 24 metals. For manganese, there was a 4.9% difference between the original sample and its 5-fold dilution. Due to the fact that this percent deviation was not greater than 10%, data qualification was not necessary. ICP serial dilutions will be evaluated collectively for the January 2003 sampling event. Any need for data qualification on the basis of serial dilutions will be determined at that time and assigned accordingly. The orthophosphate concentrations of 0.73mg/L in sample P-1-T01D-GRW and 0.068 mg/L in sample US-1-T01N-GRW were greater than their phosphorus concentrations of 0.012mg/L and 0.01 mg/L respectively. Due to the fact that both partial and total concentrations for both samples did not exceed 5x the RL (in the first sample 0.02mg/L and 0.01mg/L in the later), the absolute difference between the partial and total results were compared to an evaluation criterion of ±2x RL. The orthophosphate and phosphorus results for samples P-1-T01D-GRW and US-1-T01N-GRW were qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of the data. All reported anion/cation balances met this criterion and subsequently did not require data qualification.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) P-1-T01D-GRW P-1-D01D-GRW P-2-T01D-GRW P-2-D01D-GRW LS3-T01D-GRW LS3-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) TB100-GRW	NA	There were a few detections in the various field duplicates (FD). These are summarized in Table 1.3. The FD results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The trip blank TB100-GRW was nondetect for all target analytes. It is therefore unlikely that any cross-contamination may have resulted from sam ple containers or during the transportation , storage phases.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historical data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The LCS results for explosives were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial and continuing calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Sulfate (mg/L)
P-1-T01N-GRW	---	---	---	---	1060 J
P-1-T01D-GRW	---	---	---	---	1070 J
MMW-22-T01N-GRW	---	---	---	4580 J	3020 J
OUTFALL002-T01N-GRW	0.0050 UJ	0.45 J	0.068 J	---	843 J
MW-13-T01N-GRW	0.0050 UJ	0.73 J	0.012 J	---	253 J
LS3-T01N-GRW	0.0050 UJ	0.48 J	0.010 UJ	---	171 J
LS3-T01D-GRW	0.0050 UJ	0.47 J	0.010 UJ	---	169 J
US-1-1T01N-GRW	---	---	---	---	72.4 J
LS-1-T01N-GRW	---	---	---	343 J	169 J
P-2-T01D-GRW	---	---	---	1110 J	689 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Arsenic (P)	---	---	-3.8	-4.5	-4.1	-3.479	2.3	MMW-22-D01N-GRW, MMW-22-T01N-GRW, P-2-D01D-GRW, P-2-T01D-GRW	UJ MB-L J CCB-L UJ CCB-L
Antimony (MS)	1.5	1.4	1.3	1.3 3.0	---	---	2.8	LS3-T01N-GRW	U CCB-I
Boron (P)	9.1	5.9	4.4	4.5	6.9	6.511	2.7	P-1-T01D-GRW, US-1-D01N-GRW, US-1-T01N-GRW, LS-1-D01N-GRW, LS-1-T01N-GRW, LS3-D01D-GRW, LS3-D01N-GRW, LS3-T01D-GRW, MW-13-D01N-GRW MW-13-T01N-GRW LS3-T01N-GRW, OUTFALL002-D01N-GRW, OUTFALL002-T01N-GRW, P-1-D01N-GRW, P-1-T01N-GRW,	U MB, CCB-I U MB-I
Copper (P)	---	1.8	---	---	---	1.70	1.7	LS3-T01D-GRW, LS3-D01D-GRW OUTFALL002-D01N-GRW, OUTFALL002-T01N-GRW	U CCB-I U MB-I

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3a
Comparison of Positive Field Duplicates P-1-T01N-GRW/ P-1-T01D-GRW

Analyte	P-1-T01N-GRW (µg/l)	P-1-T01D-GRW (µg/l)	CRDL with Dilution Factor	RPD/Absolute Difference	Action
Chloride	21.2	1.4	RL= 1 RL=2	3.9X RL	J FD-I for parent and duplicate sample
Orthophosphate	<0.01	0.73	RL= 1 RL= 2	72x RL	J FD-I for parent and duplicate sample

Table 1.3b
Comparison of Positive Field Duplicates P-2-T01N-GRW/ P-2-T01D-GRW

Analyte	P-2-T01N-GRW (µg/l)	P-2-T01D-GRW (µg/l)	RL with Dilution Factor	RPD/Absolute Difference	Action
TDS	1760	1110	5.0	45.3	J FD-I for parent and duplicate sample
Chloride	17.1	1.2	1.0	39.8x RL	J FD-I for parent and duplicate sample
Ammonia	.19	0.093	0.04	2.4x RL	J FD-I for parent and duplicate sample

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT037 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 03/14/03

Peer Reviewer: Stacey Coker Date Completed: 03/28/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Metals	Inorganics	VOCs	SVOCs	Explosives
P-2-T01N-GRW	SA	514805		W	X	X	X	X	X
P-2-D01N-GRW	SA	514806		W	X				
US-2-T01N-GRW	SA	514807		W	X	X			
US-2-D01N-GRW	SA	514808		W	X				
US-2-T01D-GRW	FD	514809		W	X	X			
US-2-D01D-GRW	FD	514810		W	X				
SPRING14T-T01N-GRW	SA	514811		W	X	X			
SPRING14T-D01N-GRW	SA	514812		W	X				
SPRING15-T01N-GRW	SA	514813		W	X	X			
SPRING15-D01N-GRW	SA	514814		W	X				
MMW-34B-T01N-GRW	SA	514815	MMW34BT01NGR	W	X	X	X	X	X
MMW-34B-D01N-GRW	SA	514816		W	X				
MMW-19A-T01N-GRW	SA	514817	MMW19AT01NGR	W	X	X			X
MMW-19A-D01N-GRW	SA	514818		W	X				
MMW-19B-T01N-GRW	SA	514819	MMW19BT01NGR	W	X	X			X
MMW-19B-D01N-GRW	SA	514820		W	X				
SPRING9-T01N-GRW	SA	514821		W	X	X			
SPRING9-D01N-GRW	SA	514822		W	X				
SPRING10-T01N-GRW	SA	514823		W	X	X			
SPRING10-D01N-GRW	SA	514824		W	X				
TB109-GRW	TB	514825		W			X		
TB105-GRW	TB	514826		W			X		

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The samples in this sample delivery group (SDG) were re-analyzed for sulfate by method 375.4. The re-analysis was requested after the analytical holding time had expired. The raw data from the original sulfate analyses by method 300.0, which were performed within the holding time, are provided in the data package. The results from the re-analyses are formally presented in the case submittal. Table 1.1 below summarizes the qualification for sulfate holding time.

The original Total Dissolved Solids (TDS) analyses of samples US-2-T01D-GRW and MMW-19A-T01N-GRW that were performed within holding time, yielded a net weight after drying that greatly exceeded the upper limit of the method for some samples. These samples were re-analyzed using a smaller sample volume outside of holding time yielding results that did not compare well with the original analyses. The results from the original analyses have been formally presented in this case submittal, with the data from the re-analyses are formally presented in this case submittal. No qualification of the associated data was considered necessary.

The metals analyses in this SDG were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of samples, which were determined by the field pH determinations.

A volatile organic holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and is labeled HBW037.

Manual integration was employed in deriving results for the volatile and semi-volatile organics analyses in this SDG. The laboratory on the quantitation reports qualifies the values that have been derived from manual integration and extracted ion current profiles are included in the SDG.

The nitroaromatics analysis of laboratory control sample LCS yielded a slightly low percent recovery (LCS=50%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time; therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The times of collection for samples SPRING10-T01N-GRW and SPRING10-D01N-GRW were accidentally not written on the COC. The laboratory was contacted and the correction was made so that the collection time for these two samples were logged in using the time taken form the container labels. The laboratory noted that two samples for cyanide analysis were received at an improper pH, which may have resulted in possible loss of cyanide. The affected samples are MMW-34B-T01N-GRW, and MMW-19A-T01N-GRW. The nondetect results were qualified as estimated (UJ). The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Holding Times	No	The 48-hour holding time were exceeded by less than 48 hours for nitrate as N, nitrite as N, orthophosphate, and the 28 day holding time was exceeded by less than fifteen days for sulfate. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Antimony, arsenic, boron, copper, molybdenum, and potassium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In all cases, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKW9. TICs in method blanks are not considered to be reportable as TICs for samples and their identification as TICs was rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution P-2-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	Recovery for internal standard Y was high for the ICPMS analysis of samples P-2-T01N-GRW, P-2-D01N-GRW, MMW-34B-T01N-GRW, MMW-34B-D01N-GRW, MMW-19A-T01N-GRW, and MMW-19A-D01N-GRW. Therefore, the molybdenum results for these were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For samples US-2-T01D-GRW, SPRING14T-T01N-GRW, and SPRING15-T01N-GRW the partial analysis of orthophosphate exceeded that of the total analysis of phosphorus and did not meet acceptance criteria. Table 1.3 summarizes these results and the data qualifications. In calculating the charge balances, it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit for samples US-2-T01N/D01N-GRW, US-2-T01D/D01D-GRW, SPRING14T-T01N/D01N-GRW, SPRING15-T01N/D01N-GRW, SPRING9-T01N/D01N-GRW, and SPRING10-T01N/D01N-GRW. Upon reviewing the cation and anion results, and comparison to historical data it was determined that the measured TDS result is biased high as summarized in Table 1.4. Thus, only the measured TDS results for these samples were qualified as estimated (J).
Field QC • Field Duplicate (FD) US-2-T01N-GRW US-2-T01D-GRW US-2-D01N-GRW US-2-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) TB109-GRW TB105-GRW • Other (e.g., splits)	No	There was one set of field duplicates (FD) results that did not meet acceptance criteria. These are summarized in Table 1.5. The FD results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The semivolatile analysis of laboratory control samples LCS yielded a slightly high percent recovery of the target compounds 4-Nitrophenol (J7LCS=99%), and Pentachlorophenol (J7LCS=105%). The CLP method does not require the blank spike to be analyzed for the semivolatile organic compounds; however, the laboratory did report these values along with their historical QC limits of 4-Nitrophenol (10-80%), and Pentachlorophenol (9-103%). The blank spike in this analytical set is actually at a higher or equivalent accuracy than the historical QC limits. Accuracy of 4-Nitrophenol (99%), and Pentachlorophenol (105%) are considered acceptable; therefore no qualifications are necessary. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The continuing calibration for SVOCs were not within their percent recoveries; Table 1.6 summarizes the results. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Sulfate (mg/L)
P-2-T01N-GRW	---	---	---	701 J
US-2-T01N-GRW	1.2 J	0.005 UJ	0.010 UJ	296 J
US-2-T01D-GRW	1.2 J	0.005 UJ	1.3 J	307 J
SPRING14T-T01N-GRW	0.59 J	0.005 UJ	3.1 J	120 J
SPRING15-T01N-GRW	0.58 J	0.005 UJ	1.2 J	17.2 J
MMW-34B-T01N-GRW	2.2 J	0.005 UJ	0.010 UJ	1920 J
MMW-19A-T01N-GRW	4.6 J	0.005 UJ	0.070 J	1590 J
MMW-19B-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ	1560 J
SPRING9-T01N-GRW	1.6 J	0.005 UJ	0.063 J	584 J
SPRING10-T01N-GRW	0.61 J	0.005 UJ	0.018 J	198 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	1.5	1.4	1.5	1.5	1.4	1.5	-0.612	0.30	MMW-19B-T01N-GRW, MMW-19B-D01N-GRW, SPRING10-T01N-GRW, SPRING10-D01N-GRW, SPRING14T-T01N-GRW, SPRING14T-D01N-GRW, SPRING15-T01N-GRW, SPRING15-D01N-GRW, SPRING9-T01N-GRW, SPRING9-D01N-GRW, US-2-T01N-GRW, US-2-D01N-GRW, US-2-T01D-GRW, US-2-D01D-GRW	UJ MB-L
Arsenic (P)	2.5				5.8			2.3	P-2-D01N-GRW	U CCB-I
Boron (P)	7.9 5.7	5.0	3.9	6.6	4.4			2.7	MMW-19B-T01N-GRW, MMW-19B-D01N-GRW, P-2-T01N-GRW, SPRING9-T01N-GRW, SPRING9-D01N-GRW, US-2-T01N-GRW, US-2-D01N-GRW, US-2-T01D-GRW, US-2-D01D-GRW	U CCB-I
Copper (P)			2.8		---	---		1.7	MMW-19B-T01N-GRW, MMW-19B-D01N-GRW, SPRING10-T01N-GRW, SPRING10-D01N-GRW, SPRING15-D01N-GRW, SPRING9-T01N-GRW, SPRING9-D01N-GRW	U CCB-I
Molybdenum (P)	1.8 -2.2	-2.3	1.4 -1.3	-1.3	---		-1.267	1.1	MMW-19A-T01N-GRW, MMW-19A-D01N-GRW, MMW-19B-T01N-GRW, MMW-19B-D01N-GRW, P-2-T01N-GRW, P-2-D01N-GRW, US-2-T01N-GRW, US-2-D01N-GRW, US-2-T01D-GRW, US-2-D01D-GRW	UJ CCB-I UJ MB-L
Potassium (P)			-352.1					201.8	MMW-19A-T01N-GRW, MMW-34B-T01N-GRW, MMW-34B-D01N-GRW, P-2-T01N-GRW, P-2-D01N-GRW	UJ CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank MB = Method Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications

Sample	Analytes	Absolute Difference Total	RL	Evaluation Criterion	Qualification Code
US-2-T01D-GRW	Orthophosphate/ Phosphorus (mg/L)	1.29	0.25		J/UJ TvP-I
SPRING14T-T01N-GRW	Orthophosphate / Phosphorus (mg/L)	3.1	0.5		
SPRING15-T01N-GRW	Orthophosphate/ Phosphorus (mg/L)	1.19	0.1		

Table 1.4
Total vs. Partial Qualifications for TDS

Sample	Historical TDS Measured Data		TDS Measured	TDS Calculated	Qualification
US-2-T01N -GRW	488	400	3990	495	TvP-H
US-2-T01D-GRW	488	400	4020	512	
SPRING14T-T01N -GRW	315	---	3630	310	
SPRING15-T01N -GRW	174	180	3790	166	
SPRING9-T01N -GRW	699	920	3820	1059	
SPRING10-T01N -GRW	413	520	2100	535	

Table 1.5
Comparison of Positive Inorganic Field Duplicates

Analyte	US-2-T01N-GRW (mg/l)	US-2-T01D-GRW (mg/l)	Absolute Difference	RL	Qualification
Orthophosphate	<0.010	1.3	1.29	0.01	J/UJ FD-I

Table 1.6
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
1/23/03 (2124)	Acetone	42.1	Results for these analytes in associated samples were qualified as estimated.	J CCAL-I or UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
1/20/03 (1156)	2,4-Dinitrophenol 4-Nitrophenol Di-n-octylphthalate	30.6% 27.3% 45.0%	Results for these analytes in associated samples were qualified as estimated.	J CCAL-I or UJ CCAL-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT038 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Ansley Watson Date Completed: 03/19/03

Peer Reviewer: Alan Roberts Date Completed: 03/28/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
US-3-T01N-GRW	SA	514840		W	X	X					
US-3-D01N-GRW	SA	514841		W	X						
SPRING17-T01N-GRW	SA	514842		W	X	X					
SPRING17-D01N-GRW	SA	514843		W	X						
LS2-T01N-GRW	SA	514844		W	X	X					
LS2-D01N-GRW	SA	514845		W	X						
MMW-25B-T01N-GRW	SA	514846	MMW25BT01NGR	W	X	X			X		
MMW-25B-D01N-GRW	SA	514847		W	X						
MMW-31B-T01N-GRW	SA	514848	MMW31BT01NGR	W	X	X			X		
MMW-31B-D01N-GRW	SA	514849		W	X						
TB121-GRW	TB	515850		W			X				
MMW-21-T01N-GRW	SA	514851	MMW21T01NGRW	W	X	X	X	X	X		
MMW-21-D01N-GRW	SA	514852		W	X						
RB07T-GRW	RB	514853		W	X	X					
RB07D-GRW	RB	514854		W	X						
COMPANY CABIN-T01N-GRW	SA	514855	COMPANYCABIN	W	X	X					
COMPANY CABIN-D01N-GRW	SA	514856		W	X						
TB24T-SFW	TB	514857		W			X				
DECANT-T01N-GRW	SA	514858		W	X	X				X	X
DECANT-D01N-GRW	SA	514859		W	X						
FB03T-GRW	FB	514860		W					X		
FB02-GRW	FB	514861		W			X	X			
RB08T-GRW	RB	514862		W	X	X					
TB117-SOL	TB	514863		W			X				
FB10-SOL	FB	514864		W			X	X	X		

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The samples in this sample delivery group (SDG) were re-analyzed for sulfate by method 375.4. The re-analysis was requested after the analytical holding time had expired. The raw data from the original sulfate analyses by method 300.0, which were performed within the holding time, are provided in the data package. The results from the re-analyses are formally presented in the case submittal. Table 1.1 below summarizes the qualification for sulfate holding time.

The original Total Dissolved Solids (TDS) analysis of sample MMW-21-T01N-GRW, which was performed within holding time, yielded a net weight after drying that greatly exceeded the upper limit of the method. This sample was re-analyzed using a smaller sample volume outside of holding time yielding results comparable to the original analysis. The results from the re-analysis are formally presented in this case submittal. Table 1.1 summarizes the holding time qualifications.

The metals analyses of the samples in this delivery group were performed at the dilution levels established by client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the filed pH determinations.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were problems noted with sample receipt. • The times of collection for sample LS2-T01N-GRW was accidentally not written on the COC. The laboratory was contacted and the correction was made so that the collection time for this sample was logged in using the time taken from the container labels. • Sample FB02-GRW was inadvertently marked on the COC for Semi-volatile Organic Compound (SVOC) analysis, however, no volumes were sent for the analysis. The laboratory was contacted and the correction was made so that this sample was not logged in for SVOC analysis. • The laboratory noted that one sample for cyanide analysis was received at an improper pH, which may have resulted in possible loss of cyanide. The affected sample is MMW-21-T01N-GRW. The nondetect results were qualified as estimated (UJ). The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	The 48-hour holding time were exceeded by less than 48 hours for nitrate as N, nitrite as N, orthophosphate, the 7 day holding time was exceeded by less than twelve days for TDS, and the 28 day holding time was exceeded by less than eighteen days for sulfate. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Blanks	No	Aluminum, antimony, boron, iron, manganese, mercury, molybdenum, sodium, and 1,2,4-trichlorobenzene were detected in various blanks. Table 1.2 summarizes the blank detections resulting in sample qualification and the resultant data qualifications. In all cases, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKJ7. TICs in method blanks are not considered to be reportable as TICs for samples and their identification as TICs was rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC • MS/MSD/PDS US-3-T01N-GRW US-3-D01N-GRW MMW-31B-T01N-GRW MMW-31B-D01N-GRW • LD	Yes	The matrix spike (MS) percent recovery for some analytes was out of limits in sample MMW-31B-T01N-GRW and MMW-31B-D01N-GRW. Table 1.3 summarizes these MS results. The MS results for the May 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent samples were qualified on the basis of MS results.
Method QC • Surrogates • Serial Dilution US-3-T01N-GRW US-3-D01N-GRW MMW-31B-T01N-GRW MMW-31B-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery for the explosive analysis was low in samples MMW-21-T01N-GRW and COMPANYCABIN-T01N-GRW. The recoveries of 1,2-dinitrobenzene were 78% and 82%, respectively. This recovery is outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Because the surrogate recovery is lower than the acceptance limit but greater than 10%, all explosive results for sample MMW-21-T01N-GRW and COMPANYCABIN-T01N-GRW were qualified as estimated (UJ). The serial dilution analyses were conducted on four samples. For samples US-3-T01N-GRW and US-3-D01N-GRW, none of the analytes concentrations were high enough for the serial dilution results to be useable in ascertaining any interferences. For samples MMW-31B-T01N-GRW and MMW-31B-D01N-GRW, the serial dilution results were applicable for 7 of the 24 metals. The percent difference between the original result and result for the diluted sample for cobalt in sample MMW-31B-D01N-GRW did not satisfy the ≤10% criterion. Table 1.4 summarizes this result. For sample DECANT-T01N-GRW recoveries were low for the internal standards Bi, Se, In, Y and Li. Data qualification was not necessary as none of the reported results were quantitated using these low internal standard results. For samples SPRING17-T01N-GRW, LS2-T01N-GRW, and COMPANYCABIN-T01N-GRW the partial analysis of orthophosphate exceeded that of the total analysis of phosphorus and did not meet acceptance criteria. Table 1.5 summarizes these results and the data qualifications. For sample RB07T/D-GRW, the cation/anion balance was outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB01T-GRW RB01D-GRW RB03T-GRW RB03D-GRW RB23T-GRW • Field Blank (FB) FB04T-GRW 1325 FB04T-GRW 1345 FB43T-SOL FB44T-SOL • Trip Blank (TB) TB115-SOL TB127-SOL TB124-SOL TB125-SOL TB126-SOL • Other (e.g., splits)	No	There were a few detections in the various rinsate blanks. These are summarized in Table 1.6. The field quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Review Parameter	Criteria Met?	Comments
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	No	The relative response factor for the series of calibration standards for benzaldehyde exceeded the maximum % relative standard deviation of 30% for SVOC. Table 1.7 summarizes the initial calibration results that were outside the evaluation criteria and any resultant data qualification issues.
Continuing Calibration	No	During the alkalinity analysis of the samples in this SDG, the associated blank samples CCB2, CCB3, and CCB4 yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the concentration was less than the RL listed in the QAPP, and therefore sample results were reported from this analysis. No qualification of the associated data was considered necessary. The relative response factor for the series of calibration standards for exceeded the maximum % difference of 25%. Table 1.8 summarizes the continuing calibration results that were outside the evaluation criteria and any resultant data qualification issues.
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	No	The semivolatile analysis of laboratory control sample (LCS) yielded a slightly high percent recovery of the target compounds 4-Nitrophenol (LCS=99%), and Pentachlorophenol (LCS=105%). The CLP method does not require the blank spike to be analyzed for the semivolatile organic compounds; however, the laboratory did report these values along with their historical QC limits of 4-Nitrophenol (10-80%), and Pentachlorophenol (9-103%). Accuracy of 4-Nitrophenol (99%), and Pentachlorophenol (105%) are considered acceptable in spite of being outside historic limits; therefore no qualifications are necessary. The nitroaromatics analysis of laboratory blank spike yielded a slightly low percent recovery (LCS=50%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Yes	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Sulfate (mg/L)
US-3-T01N-GRW	0.52 J	0.005 UJ	0.010 UJ	---	47.5 J
SPRING17-T01N-GRW	0.66 J	0.005 UJ	0.092 J	---	113 J
LS2-T01N-GRW	0.43 J	0.005 UJ	2.1 J	---	168 J
MMW-25B-T01N-GRW	0.40 J	0.005 UJ	0.015 J	---	1370 J
MMW-31B-T01N-GRW	0.20 UJ	0.005 UJ	0.010 UJ	---	1890 J
MMW-21-T01N-GRW	0.40 UJ	0.005 UJ	0.23 J	4630 J	3450 J
RB07T-GRW	0.52 J	0.005 UJ	0.010 UJ	---	5.0 UJ

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Sulfate (mg/L)
COMPANYCABIN-T01N-GRW	0.83 J	0.005 UJ	0.47 J	---	68.6 J
DECANT-T01N-GRW	0.72 J	0.0089 J	0.032 J	---	693 J
RB08T-GRW	0.20 UJ	0.005 UJ	0.010 UJ	---	5.0 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)		-45.3					14.2	LS2-T01N-GRW, LS2-D01N-GRW, MMW-25B-D01N-GRW, SPRING17-T01N-GRW, SPRING17-D01N-GRW, US-3-T01N-GRW, US-3-D01N-GRW	UJ CCB-L
Antimony (MS)	0.4 0.9	0.3 0.8	0.4	0.5	0.5		0.3	US-3-T01N-GRW, DECANT-D01N-GRW	U CCB-I
Boron (P)	8.1	6.8	4.6	5.0	6.9	5.107	2.7	COMPANYCABIN-T01N-GRW, COMPANYCABIN-D01N-GRW, DECANT-T01N-GRW, DECANT-D01N-GRW, LS2-T01N-GRW, LS2-D01N-GRW, MMW-25B-T01N-GRW, MMW-25B-D01N-GRW, MMW-31B-T01N-GRW, MMW-31B-D01N-GRW, RB07T-GRW, RB07D-GRW, US-3-T01N-GRW, US-3-D01N-GRW	U CCB-I U MB-I
Molybdenum (P)				1.2			1.1	COMPANYCABIN-T01N-GRW, COMPANYCABIN-D01N-GRW, RB07D-GRW, RB08T-GRW,	U CCB-I

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Recovery Not Meeting Criteria

Sample/Analytes	Matrix Spike Recovery	Acceptance Limits	Action
MMW-31B-T01N-GRW			
PYX	21% 40%	70-130%	Qualify parent sample J MS-L

Table 1.4
Serial Dilution Qualifications

Sample Analyte	%Difference	Action
MMW-31B-D01N-GRW • Cobalt	10.8%	Qualify parent sample J DL-L

Table 1.5
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Absolute difference	Higher RL	Action
SPRING17-T01N-GRW • Orthophosphate Vs. Phosphorus	0.077	0.010	Results for these analytes in the SPRING17-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
LS2-T01N-GRW • Orthophosphate Vs. Phosphorus	2.089	0.25	Results for these analytes in the LS2-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
COMPANYCABIN-T01N-GRW • Orthophosphate Vs. Phosphorus	0.46	0.010	Results for these analytes in the COMPANYCABIN-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.

Table 1.6
Positive Results for Rinsate Blanks

Analyte	RB07T-GRW	RB07D-GRW	RB08T-GRW
TDS (mg/L)	21	---	23
TSS (mg/L)	0.60	---	---
Bicarbonate Alkalinity (mg/L)	2.6	---	2.8
Total Alkalinity (mg/L)	2.6	---	2.8
Ammonia (mg/L)	0.15	---	0.18
Chloride (mg/L)	1.4	---	0.27
Nitrate (mg/L)	0.52	---	---
Analyte	**RB07T-GRW**	**RB07D-GRW**	**RB08T-GRW**
Hardness (mg/L)	---	26.7	---
Beryllium (µg/L)	---	1.3	---
Copper (µg/L)	2.3	1.8	---
Calcium (µg/L)	---	9970	---
Manganese (µg/L)	---	72.7	---

Table 1.7
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC ICAL Date/Time	Analyte	|%D| >30%	Action	Qualification and Qualification Codes
1/06/03 (0921)	Benzaldehyde	39.3%	Results for these analytes in associated samples were qualified as estimated.	UJ ICAL-I

ICAL = Initial Calibration

Table 1.8
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
1/21/03 (0921)	Benzaldehyde Di-n-octylphthalate	-99.9% -44.9%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT039 Sampling Event: Fall 2002

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 03/13/03

Peer Reviewer: Alan Roberts Date Completed: 04/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
MMW-29A-T01N-GRW	SA	514910	MMW29AT01	W	X	X			X		
MMW-29A-D01N-GRW	SA	514911		W	X						
MMW-11-T01N-GRW	SA	514912	MMW11T01NGRW	W	X	X			X		
MMW-11-D01N-GRW	SA	514913		W	X						
MMW-11-T01D-GRW	FD	514914	MMW11T01DGRW	W	X	X			X		
MMW-11-D01D-GRW	FD	514915		W	X						
P-3-T01N-GRW	SA	514916		W	X	X			X		
P-3-D01N-GRW	SA	514917		W	X						
MMW-29B-T01N-GRW	SA	514918	MMW29BT01NGR	W	X	X			X		
MMW-29B-D01N-GRW	SA	514919		W	X						
MMW-38A-T01N-GRW	SA	514920	MMW38AT01NGR	W	X	X			X		
MMW-38A-D01N-GRW	SA	514921		W	X						
RB20T-SOL	RB	514922		W	X	X	X	X			
RB21T-SOL	RB	514923		W	X	X	X	X			
MMW-36B-T01N-GRW	SA	514924	MMW-36B-GRW MMW36BT01NGR	W	X	X	X	X	X		
MMW-36B-D01N-GRW	SA	514925		W	X						
FB01T-GRW	FB	514926		W			X	X	X		
FB11-SOL	FB	514927		W			X	X			X
TB104-GRW	TB	514928		W			X				
TB106-SOL	TB	514929		W			X				
TB108-SOL	TB	514930		W			X				

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The original Total Dissolved Solids (TDS) analyses of samples MMW-38A-T01N-GRW and MMW-36B-T01N-GRW, perfomed within holding time, yielded net weights that greatly exceeded the upper limit of the method after drying. These samples were reanalyzed using smaller sample volumes outside of holding time, yielding results comparable to the original analysis. The results from the re-analyses were formally presented, with data from the original analyses included with the raw data for this package. TDS results for samples MMW-38A-T01N-GRW and MMW-36B-T01N-GRW were qualified as estimated (J) with an indeterminate bias direction.

As requested, the samples in this delivery group were re-analyzed for sulfate by method 375.4. This request and subsequent re-analysis occurred after the holding time had expired. Raw data from the original sulfate analyses (method 300.0) were performed within the holding time and presented in the data package. The results from the re-analyses were formally presented in the case submittal. Table 1.1 summarizes holding time qualifications.

During the alkalinity analysis from 01/21/03, the continuing calibration blank samples designated CCB#2, CCB#3, and CCB#4 yielded alkalinity concentrations that were marginally above the laboratory's reporting limit. However, these concentrations fell below the reporting limits specified by the QAPP and were subsequently reported. This did not affect the quality or usability of the data.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile organic holding blank was carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and labeled HBW039. The laboratory's case narrative identified the holding blank as HBW035, however results are presented for HBW039.

Manual integration was employed in deriving results for the volatile and semi-volatile organics analyses in this SDG. The values derived from manual integration were qualified by the laboratory and included in the quantitation reports. These reports, along with extracted ion current profiles were included in the SDG.

The laboratory case narrative noted the nitroaromatic analysis of the blank spike samples with this delivery group yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded recoveries below the default control limits. The laboratory has not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recovery of 55% was less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J), with a low bias direction.

The pesticide/PCB analysis of the blank spike samples Q1LCS and Q1LCSD yielded percent recoveries for Endrin and 4,4'-DDT that exceeded control criteria. No target analytes were detected in any of the associated field samples above the reporting limit, and therefore did not require qualification.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, samples MMW-11-T01N-GRW, MMW-38A-T01N-GRW, and MMW-36B-T01N-GRW for cyanide analysis were received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect cyanide results for these three samples were qualified as estimated (UJ), with an indeterminate bias direction. The laboratory noted sample MMW-36B-T01N-GRW (supported by the sample id on containers) was listed on the chain of custody as MMW-36-T01N-GRW.
Holding Times	No	Sample MMW-38-A-T01N-GRW for the analysis of total dissolved solids (TDS) was analyzed 10 days beyond the prescribed analytical holding time of 7 days, and as a result was qualified as estimated (J/UJ). All sulfate analyses were run 15 days beyond their prescribed 28-day hold time. Subsequently, all sulfate results were qualified as estimated (J/UJ). Table 1.1 summarizes the holding time detections and the resultant data qualifications. The associated bias direction for these results qualified on the basis of holding times are indeterminate.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2b summarizes the blank detections and the resultant data qualifications. In all cases, the results were qualified as nondetect at the reported value or estimated (J/UJ) for negative blank concentrations.
Matrix QC • MS/MSD MMW-29A-T01N-GRW-MS/MSD MMW-29A-D01N-GRW-MS/MS • PDS MMW-29A-TO1N-GRW MMW-29A-D01N-GRW • LD MMW-29A-T01N-GRW-REP MMW-29A-D01N-GRW-REP	No	The two matrix spike samples reported several matrix analytes outside the control criteria of 75-125% recovery for both inorganics and metals. Table 1.3 summarizes the matrix spike and matrix spike duplicate analytes recovered outside the specified control criteria, along with data qualifications of the parent samples. Post digestion spikes were performed on those metal analytes that did not meet criteria for matrix spikes. All post digestion spikes recoveries were within acceptable range of 75-125% with the exception of cyanide (53.2%) for sample MMW-29A-T01N-GRW. This cyanide result was qualified as estimated UJ with a low bias direction and a qualifier code of "PDS". Both chloride results for sample MMW-29A-T01N-GRW (18.9 mg/L) and the laboratory duplicate sample MMW-29A-T01N-GRWREP (26.5 mg/L) were greater than 5x the RL (1.0mg/L). The RPD between the two results was 33%, outside the control criterion of +/-20%. The chloride result for the parent sample was qualified as estimated (J) with an indeterminate direction of bias with a qualifier code of "D". Note: The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution MMW-29A-T01N-GRW MMW-29A-D01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	All surrogate recoveries for samples were within acceptance ranges and data qualification was not necessary. ICP serial dilution analyses were conducted on samples MMW-29A-T01N-GRW and MMW-29A-D01N-GRW. In both serial dilution analyses, only manganese was sufficiently high enough to be applicable to the dilution. In both samples, the percent difference between the original sample and its five-fold dilution was ≤ 10%; thereby satisfying the criteria as set forth in the QAPP. An interference effect is not suspected and subsequently no qualification of data was necessary. The orthophosphate concentrations of 0.097 mg/L in sample MMW-29A-T01N-GRW and 0.84mg/L in sample MMW-11-T01N-GRW are greater than their corresponding phosphorus concentrations of 0.016mg/L and 0.037mg/L, respectively. Due to the fact that both values are not greater than 5x the RL (0.010), the absolute difference between the results is compared against an evaluation criterion of ±2x RL. Accordingly, the phosphorus and orthophosphate results for samples MMW-29A-T01N-GRW and MMW-11-T01N-GRW were qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion and subsequently did not require data qualification. The ratios of the calculated versus mearsured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate (FD) MMW-11-T01D-GRW MMW-11-D01D-GRW • Rinsate Blank (RB) RB20T-SOL (01/13/03) RB21T-SOL (01/13/03) • Field Blank (FB) FB01T-GRW (01/13/03) FB11-SOL (01/13/03) • Trip Blank (TB) TB104-GRW (01/13/03) TB106-SOL (01/13/03) TB108-SOL (01/13/03)	NA	Field duplicates were assessed for overall precision of the analyte and representativeness to the medium. Table 1.4a summarizes field duplicate results for reference at the later overall January 2003 assessment. No analytes were detected in any trip blanks associated with this data package. Table 1.4b summarizes analytes detected in the rinsate and field blanks. The Field QC results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The LCS results for explosives were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial Calibration • VOCs/SVOCs: Continuing Calibration Tables 1.5a and 1.5b summarize the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	TDS (mg/L)	Sulfate (mg/L)
MMW-29A-T01N-GRW	---	1080 J
MMW-11-T01N-GRW	---	1680 J
MMW-11-T01D-GRW	---	1790 J
P-3-T01N-GRW	---	876 J
MMW-29B-T01N-GRW	---	457 J
MMW-38A-T01N-GRW	10500 J	6830 J
RB20T-SOL	---	5.0 UJ
RB21T-SOL	---	5.0 UJ
MMW-36B-T01N-GRW	4690 J	3680 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	17.7 29.5	30.4	15.2	17.0 35.4	17.4	21.780	14.2	MMW-29B-T01N-GRW	U MB, CCB-I
Boron (P)	6.5	4.6	2.9	3.8	4.6	5.005	2.7	MMW-29B-T01N-GRW MMW-29B-D01N-GRW MMW-11-T01N-GRW MMW-29A-D01N-GRW MMW-29A-T01N-GRW MMW-38A-D01N-GRW MMW-38A-T01N-GRW P-3-T01N-GRW	U MB, CCB-I U CCB-I
Iron (P)	34.2	27.6	---	30.3	---	---	48.9	MMW-38A-D01N-GRW MMW-38A-T01N-GRW	U CCB-I
Postassium (P)	285.1	230.4	347.9	375.3	---	---	201.8	RB21T-SOL	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Zinc (P)	-5.0	-6.3	-7.4	-7.7	-7.8	---	3.9	MMW-29B-T01N-GRW MMW-29B-D01N-GRW RB20T-SOL RB21T-SOL	UJ CCB-L

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Parent Qualifications

Sample	Analyte	% Recovery	Control Criteria	Qualification Code
MMW-29A-T01N-GRW *(pH class A sample)	Bicarbonate Alkalinity	21.0	<30%	When this sample* was spiked, the alkalinity/bicarbonate reacted with the acid to lower the spike recovery. This was not a measure of the accuracy of the analysis, therefore sample results were considered usable. The parent sample was qualified as estimated J/UJ MS-L
	Total Alkalinity	21.0		
	Fluoride	134.7	>125%	J MS-H
	Orthophosphate	47.7	≥30%	J MS-L
	Cadmium	211.2	>125%	All results for these analytes were nondetect, therefore no qualification necessary.
	Cobalt	145.2		
	Iron	158.2		
	Selenium	180.1		
	Cyanide	7.3	<30%	R (unusable)
	PYX	0		J/UJ MS-L
MMW-29A-D01N-GRW	Arsenic	50.7	≥30%	UJ MS-L
	Cadmium	269.2	>125%	All results for these analytes were nondetect, therefore no qualification necessary.
	Cobalt	143.3		
	Selenium	164.0		

Table 1.4a
Field Duplicate Results Outside Evaluation Criterion

Analyte	Field Duplicate	Conc. (µg/L)	Sample	Conc. (µg/L)	RL (µg/L	Action
Chloride	MMW-11-T01D-GRW	2.4	MMW-11-T01N-GRW	22.1	1.0	Qualify parent and duplicate samles as estimated J/UJ FD-I
Orthophosphate		0.037		0.84	0.010	Qualify parent and duplicate samles as estimated J/UJ F FD-I

Table 1.4b
Field Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB20T-SOL	1/13/03	Chloroform	0.006	0.01
		Ammonia-N	0.072	0.040
RB21T-SOL	1/13/03	Chloroform	0.006	0.01
		Bis (2-Ethylhexyl) phthalate	0.0009	0.01
		Ammonia-N	0.088	0.040
		Molybdenum	0.0011	0.0011
FB01T-GRW	1/13/03	Bis (2-Ethylhexyl) phthalate	800	11000
FB11-SOL	1/03/13	Bis (2-Ethylhexyl) phthalate	0.003	0.01

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.5a
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	% RSD >25%	Action	Qualification and Qualification Codes
SVOC	01/06/03 (0921)	Benzaldehyde	39.3	All sample results were qualified as estimated	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.5b
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	% RSD >25%	Action	Qualification and Qualification Codes
VOC	01/23/03 (2124)	Acetone	42.1	Results for all samples were qualified as estimated	UJ CCAL-I
		2-Butanone	30.5		
		2-Hexanone	36.1		
VOC	01/17/03 (2137)	Acetone	45.8		
		2-Butanone	34.5		
		2-Hexanone	36.8		
SVOC	01/21/03 (0724)	Benzaldehyde	-99.9	Results for all samples were qualified as estimated	UJ CCAL-I
		Di-n-octlyphthalate	-44.9		

CCAL = Initial Calibration RSD = Percent relative standard deviation

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT040 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 03/18/03

Peer Reviewer: Alan Roberts Date Completed: 04/08/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
P-4B-T01N-GRW	SA	515092	P-4B-T01N-GR	W	X	X			X		
P-4B-D01N-GRW	SA	515093		W							
MMW-30A-T01N-GRW	SA	515094	MMW30AT01NGR	W	X	X			X		
MMW-30A-D01N-GRW	SA	515095		W							
P-5B-T01N-GRW	SA	515096	P-5B-T01N-GR	W	X	X			X		
P-5B-D01N-GRW	SA	515097		W							
P-5C-T01N-GRW	SA	515098	P-5C-T01N-GR	W	X	X			X		
P-5C-D01N-GRW	SA	515099		W							
MMW-44A-T01N-GRW	SA	515100	MMW-44A-GRW MMW44AT01NGR	W	X	X	X		X		
MMW-44A-D01N-GRW	SA	515101		W							
MMW-11A-T01N-GRW	SA	515102	MMW11AT01NGR	W	X	X			X		
MMW-11A-D01N-GRW	SA	515103		W							
MMW-18B-T01N-GRW	SA	515104	MMW18BT01NGR	W	X	X			X		
MMW-18B-D01N-GRW	SA	515105		W							
MMW-44B-T01N-GRW	SA	515106	MMW-44B-GRW MMW44BT01NGR	W	X	X	X		X		
MMW-44B-D01N-GRW	SA	515107		W							
MMW-30B-T01N-GRW	SA	515108	MMW30BT01NGR	W	X	X			X		
MMW-30B-D01N-GRW	SA	515109		W							
RB04T-GRW	RB	515110		W							
RB04D-GRW	RB	512111		W	X	X			X		
TB128-GRW	TB	515112		W		X					

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The original Total Dissolved Solids (TDS) analysis of sample MMW-44A-T01N-GRW, performed within holding time, yielded net weights that greatly exceeded the upper limit of the method after drying. These samples were reanalyzed using smaller sample volumes outside of holding time, yielding results comparable to the original analysis. The results from the re-analyses were formally presented, with data from the original analyses included with the raw data for this package. TDS results for sample MMW-44A-T01N-GRW was qualified as estimated (J), with an indeterminate direction of bias.

As requested, the samples in this delivery group were re-analyzed for sulfate by method 375.4. This request and subsequent re-analysis occurred after the holding time had expired. Raw data from the original sulfate analyses (method 300.0) were performed within the holding time and presented in the data package. Table 1.2 summarizes qualifications based on holding times.

The laboratory noted in the case narrative presented with the sample data summary that the continuing calibration blank samples designated CCB#2, CCB#3, and CCB#4 yielded concentrations that were marginally above the laboratory's reporting limit during the alkalinity analysis from 01/21/03. However, these concentrations fell below the reporting limits specified by the QAPP and were subsequently reported. In addition, all alkalinity samples were run prior to 01/21/03 and therefore were not associated with the continuing calibration blank results run five days later. No qualification was necessary on the basis of continuing calibration blanks results for any of the alkalinity analyses.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile organic holding blank was carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and labeled HBW040.

Manual integration was employed in deriving results for the volatile and semi-volatile organics analyses in this SDG. The values derived from manual integration, qualified by the laboratory, are included in the SDG in the quantitation reports and extracted ion current profiles.

The laboratory case narrative noted the nitroaromatic analysis of the blank spike samples with this delivery group yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded a recovery of 55%. The laboratory has not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J), with a low bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, multiple samples for cyanide analysis were received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. In addition, one sample for the analysis of metals was received with a pH greater than 2 and subsequently required the addition of HNO_3^- to attain the proper pH for preservation. Table 1.1 summarizes the cyanide results qualified as estimated (J/UJ), with an indeterminate bias on the basis of preservation. No qualification was necessary for the metal results for sample MMW-30B-T01N-GRW due to the fact that the nitric acid added would have dissolved most of the metals that might have precipitated out. This was further supported by the observation that the diluted metal concentrations are comparable to the total metal concentrations. Upon sample receipt and log-in, a discrepancy between the laboratory COC and sample labels was identified. The collection date for samples P-5B-T/D01N-GRW, P-5C-T/D01N-GRW, MMW-44A-T/D01N-GRW, and MMW-44B-T/D01N-GRW recorded on the laboratory COC form was 1-15-03. However, the sample labels indicated that the samples were collected on 1-14-03. After reviewing the date and time of relinquishment recorded on the laboratory COC, it was determined that the sample labels were correct. As such, the samples were logged in according to the sample collection date on the sample labels. No qualification of data was necessary, as this did not affect the quality of the data.
Holding Times	No	Sample MMW-44A-T01N-GRW for the analysis of total dissolved solids (TDS) was analyzed 9 days beyond the prescribed analytical holding time of 7 days, and as a result was qualified as estimated J. All sulfate analyses were run 12-13 days beyond their prescribed 28-day hold time. Subsequently, all sulfate results were qualified as estimated (J/UJ). Table 1.2 summarizes the holding time detections and the resultant data qualifications. The associated bias direction for these results qualified on the basis of holding times are indeterminate.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.3 summarizes the blank detections and the resultant data qualifications. Results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative method blank results.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogate • Serial Dilution • Total vs. Partial Analyses • Cation/Anion Balance	No	The water explosives surrogate recoveries of S1 (1,2-Dinitrobenzene) for two samples were outside of the acceptable criteria recovery range of 85-116%. Sample MMW-30B-T01N-GRW recovered the surrogate within acceptable recoveries on the first column and was not quantifiable on the second column due to interferences. Target analytes not detected for this sample were not qualified. The chromatogram verified interferences on the second column occurred around the surrogate resulting in a lack of recovery of the surrogate and not present at the retention time of the target analytes. The surrogate on the second column was not representative of the ability to assess the accuracy of the analysis. Table 1.4a summarizes the results for these samples and any data qualification resulting. The recovery for internal standard Y was high for the ICPMS analysis of samples P-4B-T01N-GRW, P-4B-D01N-GRW, P-5C-T01N-GRW, P-5C-D01N-GRW, MMW-44A-T01N-GRW, and MMW-44A-D01N-GRW. Therefore, molybdenum results for all samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The orthophosphate concentrations in four samples were greater than their corresponding phosphorus concentrations. The absolute differences between the results for the four samples were compared against an evaluation criterion of ±2x the RL. Table 1.4b summarizes the samples with their partial and total concentrations for phosphorus and their suggested data qualifications. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion and subsequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Rinsate Blank RB04T-GRW RB04D-GRW RB01T-GRW • Field Blank FB04T-GRW • Trip Blank TB128-GRW	N/A	No analytes were detected in any trip blanks associated with this data package. Table 1.5 summarizes analytes detected in the associated rinsate and field blanks. The Field QC results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	The LCS results for explosives were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial Calibration • VOCs/SVOCs: Continuing Calibration Tables 1.6a and 1.6b summarized the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Preservation Qualifications

Analyte	Preservative	Sample	Qualification
Cyanide	Sodium Hydroxide	P-4B-T01N-GRW	UJ P-I
		MMW-30A-T01N-GRW	
		P-5B-T01N-GRW	
		P-5C-T01N-GRW	
		MMW-44A-T01N-GRW	
		MMW-11A-T01N-GRW	
		MMW-18B-T01N-GRW	
		MMW-44B-T01N-GRW	

Table 1.2
Holding Time Qualifications for Inorganics

Sample	TDS (mg/L)	Sulfate (mg/L)
P-4B-T01N-GRW	---	1160 J
MMW-30A-T01N-GRW	---	1340 J
P-5B-T01N0GRW	---	1250 J
P-5C-T01N-GRW	---	1210 J
MMW-44A-T01N-GRW	4850 J	3120 J
MMW-11A-T01N-GRW	---	1710 J
MMW-18B-T01N-GRW	---	1860 J
MMW-44B-T01N-GRW	---	1640 J
MMW-30B-T01N-GRW	---	992 J
RB04T-GRW	---	5.0 UJ

Table 1.3
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P)	37.4	25.6	---	---	---	14.930	14.2	MMW-18B-T01N-GRW, MMW-44B-T01N-GRW	U MB-I
Antimony (MS/P)	1.1 3.2	1.1	1.0	1.0	---	1.582	0.3/ 2.8	MMW-30B-T01N-GRW, MMW-44B-D01N-GRW, MMW-44B-T01N-GRW, MMW-30B-T01N-GRW	U MB,CCB-I
Arsenic (P)	---	---	-2.8	-3.1	-3.8	-2.612	2.3	MMW-11A-D01N-GRW, MMW-11A-T01N-GRW, MMW-30A-D01N-GRW, MMW-30A-T01N-GRW, MMW-44A-D01N-GRW, MMW-44A-T01N-GRW, P-4B-D01N-GRW, P-4B-T01N-GRW, P-5B-D01N-GRW, P-5B-T01N-GRW, P-5C-D01N-GRW, P-5C-T01N-GRW	UJ MB-L Or UJ MB, CCB-L

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Boron (P)	4.3 6.5	--- 4.6	-3.1 2.9	-4.3 3.8	--- 4.6	---	2.7	MMW-18B-D01N-GRW, MMW-18B-T01N-GRW, MMW-30B-D01N-GRW, MMW-30B-T01N-GRW, MMW-44A-D01N-GRW, MMW-44A-T01N-GRW, P-5C-D01N-GRW, P-5C-T01N-GRW,	J CCB-L Or UJ CCB-L
Postassium (P)	---	---	---	---	-222.1	---	201.8	RB04D-GRW, RB04T-GRW	UJ CCB-L
Molybdenum (P)	---	-1.9	-1.3	-1.4	-2.2	---	1.1	MMW-11A-D01N-GRW MMW-11A-T01N-GRW MMW-30A-D01N-GRW MMW-30A-T01N-GRW MMW-44A-D01N-GRW MMW-44A-T01N-GRW P-4B-D01N-GRW P-4B-T01N-GRW P-5B-D01N-GRW P-5B-T01N-GRW P-5C-D01N-GRW P-5C-T01N-GRW	J CCB-L Or UJ CCB-L
Zinc (P)	---	---	5.8	---	---	---	3.9	MMW-30B-T01N-GRW, MMW-44B-D01N-GRW, MMW-44B-T01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank MB=Method Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.4a
Explosive Surrogate Recoveries Outside Criteria Limits and Resultant Data Qualifications

Sample	Surrogate Compound	Criteria (85-116%)	Analytes Qualified	Qualifcation and Qualification Codes
MMW-30B-T01N-GRW	1,2-Dinitrobenzene	0*	RDX 2,4,6 TNT	J SUR-L
RB04T-GRW		84	All analytes	UJ SUR-L

*Recovery out of limits on confirmation column only. Therefore, only detects were qualified.

Table 1.4b
Total vs. Partial Analysis Data Qualification

Sample	Orthophosphate (mg/L)	Total phosphorus (mg/L)	Qualification and Qualification Codes
MMW-44A-T01N-GRW	0.76	0.12	J TvP-I or UJ TvP-I
P-5B-T01N-GRW	0.16	0.020	
MMW-18B-T01N-GRW	0.037	0.010	
MMW-30B-T01N-GRW	0.27	0.038	

Table 1.5
Field Blank Detections

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB04T-GRW	01/14/03	Total Dissolved Solids	983	5.0
		Chloride	6.7	0.40
		Bicarbonate Alkalinity	3.2	1.0
		Total Alkalinity	3.2	1.0
		Ammonia-Nitrogen	0.043	0.040
FB04T-GRW*	01/15/03			
RB01T-GRW*	01/15/03			

*Not included with the data package, but samples are associated with it.

Table 1.6a
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% RSD >30%	Action	Qualification and Qualification Codes
SVOC	01/06/03 (0921)	Benzaldehyde	39.3	Results for this analyte in all samples were qualified as estimated.	J ICAL-I or UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.6b
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

Analysis	CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
SVOC	01/21/03 (0724)	Benzaldehyde	-99.9	Results for these analytes in all samples were qualified as estimated.	J CCAL-I OR UJ CCAL-I
		Di-n-octlyphthalate	-44.9		
SVOC	01/22/03 (0546)	Benzaldehyde	35.6		
		Pentachlorophenol	30.6		
		Di-n-octlyphthalate	-50.5		
VOC	01/23/03 (2124)	Acetone	42.1		
		2-Butanone	30.5		
		2-Hexanone	36.1		
VOC	01/17/03 (2137)	Acetone	45.8		
		2-Butanone	34.5		
		2-Hexanone	36.8		

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT041 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 03/20/03

Peer Reviewer: Stacey Coker (Stacey Malerba) Date Completed: 03/28/03 (revised 8-30-06)

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RB01T-GRW	RB	515142		W	X	X	X	X	X		
RB01D-GRW	RB	515143		W	X						
FB04T-GRW	FB	515144	FB04TGRW1320	W					X		
TB115-SOL	TB	515145		W			X				
TB127-SOL	TB	515146		W			X				
MW-A-T01N-GRW	SA	515274		W	X	X					
MW-A-D01N-GRW	SA	515275		W	X						
MMW-10A-T01N-GRW	SA	515276	MMW10AT01NGR	W	X	X			X		
MMW-10A-D01N-GRW	SA	515277		W	X						
MMW-10B-T01N-GRW	SA	515278	MMW10BT01NGR	W	X	X			X		
MMW-10B-D01N-GRW	SA	515279		W	X						
MMW-10C-T01N-GRW	SA	515280	MMW10CT01NGR	W	X	X			X		
MMW-10C-D01N-GRW	SA	515281		W	X						
MW-20-T01N-GRW	SA	515282		W	X	X					
MW-20-D01N-GRW	SA	515283		W	X						
MW-24-T01N-GRW	SA	515284		W	X	X					
MW-24-D01N-GRW	SA	515285		W	X						
MMW-13-T01N-GRW	SA	515286	MMW13T01NGRW	W	X	X			X		
MMW-13-D01N-GRW	SA	515287		W	X						
RB03T-GRW	RB	515288			X	X			X		
RB03D-GRW	RB	515289		W	X						
RB23T-SOL	RB	515290		W	X	X	X	X			
FB04T-GRW	FB	515291	FB04TGRW1345	W					X		
FB43T-SOL	FB	515292		W			X	X			
FB44T-SOL	FB	515293		W			X	X			X
TB124-SOL	TB	515294		W			X				
TB125-SOL	TB	515295		W			X				
TB126-SOL	TB	515296		W			X				

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The samples in this sample delivery group (SDG) were re-analyzed for sulfate by method 375.4. The re-analysis was requested after the analytical holding time had expired. The raw data from the original sulfate analyses by method 300.0, which were performed within the holding time, are provided in the data package. The results from the re-analyses are formally presented in the case submittal. Table 1.1 below summarizes the qualification for sulfate holding time.

During the alkalinity analysis of the samples in this SDG, the associated blank samples CCB1, CCB2, CCB3, and CCB4 yielded an alkalinity concentration that was marginally above the laboratory's reporting limit (RL). However, the concentration was less than the RL listed in the QAPP, and therefore sample results were reported from this analysis. No qualification of the associated data was considered necessary.

During the nitrate analysis of the samples in this SDG, the associated blank sample CCB2 yielded a concentration at the reporting limit of 0.2 mg/L. This was discovered during the data review process, well beyond the analytical holding, therefore, the associated samples were not re-analyzed. Table 1.1 summarizes the holding time qualifications.

The metals analyses of the samples in this delivery group were performed at the dilution levels established by client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations

A volatile organic holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and is labeled HBW041.

Manual integration was employed in deriving results for the volatile and semi-volatile organics analyses in this SDG. The values that have been derived from manual integration are qualified by the laboratory on the quantitation reports and extracted ion current profiles are included in the SDG.

The nitroaromatics analysis of laboratory control samples (LCS/LCSD) yielded a slightly low percent recovery (X1LCS=55%, X7LCS=65%, and X7LCSD=65%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There was one problem noted with sample receipt. Sample FB44T-SOL was accidentally written on the COC as FB74T-SOL. The laboratory was contacted and the correction was made so that the sample was logged in with the correct field ID.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Holding Times	No	The 48-hour holding time was exceeded by less than 24 hours for nitrate as N, nitrite as N, orthophosphate, and the 28 day holding time were exceeded by less than thirteen days for sulfate. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, arsenic, boron, beryllium, iron, molybdenum, sodium, potassium, zinc, 1,2,4-trichlorobenzene, methylene chloride, 1,2-dibromo-3-chloropropane, and diethylphthalate were detected in various blanks. Table 1.2 summarizes the blank detections resulting in qualification of sample data and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKK2. TICs in method blanks are not considered to be reportable as TICs for samples and their identification as TICs was rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-10B-T01N-GRW and MMW-10B-D01N-GRW. Therefore, the molybdenum results for these samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Although serial dilutions tests were conducted for each analyte, the native sample concentration were <50x IDLs. Therefore the serial dilution results are not considered appropriate for assessing interferences. For samples RB01T-GRW, RB03T/D-GRW, MMW-10A-T01N/D01N-GRW, and MMW-10B-T01N-GRW the orthophosphate or dissolved zinc or nickel exceeded that of the total analysis of phosphorus, zinc, or nickel. Table 1.3 summarizes these results and the data qualifications. While evaluating the alkalinity results, it was observed that the sum of the alkalinity results was greater than the total alkalinity results for samples MMW-10B-T01N-GRW, MMW-13-T01N-GRW, MW-20-T01N-GRW, MW-24-T01N-GRW, MW-A-T01N-GRW, RB01T-GRW, and RB03T-GRW. The reviewer examined the raw data and found that the hydroxide alkalinity results reported on the Form 1s for these samples were incorrect. The raw data indicates that the hydroxide alkalinity results for these samples should have been reported as nondetect with a reporting limit of 1.0 mg/L. The data sheets were hand-corrected and the database was updated accordingly. For samples RB01T/D-GRW and RB03T/D-GRW, the anion/cation were 17.0% and 31.4% respectively, outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these samples results were considered necessary for charge balance.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB01T-GRW RB01D-GRW RB03T-GRW RB03D-GRW RB23T-GRW • Field Blank (FB) FB04T-GRW1325 FB04T-GRW1345 FB43T-SOL FB44T-SOL • Trip Blank (TB) TB115-SOL TB127-SOL TB124-SOL TB125-SOL TB126-SOL • Other (e.g., splits)	No	There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.4. The RB results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. There was a detection in the field blank (FB). This is summarized in Table 1.5. The FB results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The semivolatile analysis of laboratory control samples (LCS) yielded a slightly high percent recovery of the target compounds 4-Nitrophenol (LCS=93%, LCSD=103%), and Pentachlorophenol (LCS=108%, LCSD=109%). The CLP method does not require the blank spike to be analyzed for the semivolatile organic compounds; however, the laboratory did report these values along with their historical QC limits of 4-Nitrophenol (10-80%), and Pentachlorophenol (9-103%). The LCS results suggest a potential bias of less than 10%, in spite of being outside laboratory historic limits. Accuracy of 4-Nitrophenol (93% and 103%), and Pentachlorophenol (108% and 109%) are considered acceptable; therefore no qualifications are necessary. The LCS results for explosives were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The initial calibration for VOCs was within the percent recovery; therefore no qualification was necessary. The continuing calibation for the VOCS was slightly out of the percent recovery. Table 1.7 summarizes these detections in the VOCs and the resultant data qualifications. The intitial and continuing calibration for the SVOCs were slightly outside of the percent recovery. Table 1.7 and 1.8 summarizes these detections in the SVOCs and the resultant data qualifications. . • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Sulfate (mg/L)
RB01T-GRW	---	---	---	5.0 UJ
MW-A-T01N-GRW	0.40 J	0.005 UJ	0.010 UJ	505 J
MMW-10A-T01N-GRW	---	0.005 UJ	0.029 J	1630 J
MMW-10B-T01N-GRW	0.78 J	0.005 UJ	0.20 J	1800 J
MMW-10C-T01N-GRW	2.8 J	0.005 UJ	0.010 UJ	718 J
MW-20-T01N-GRW	---	---	---	130 J
MW-24-T01N-GRW	0.67 J	0.024 J	0.010 UJ	111 J
MW-13-T01N-GRW	6.2 J	0.005 UJ	0.011 J	834 J
RB03T-GRW	---	---	---	5.0 UJ
RB23T-SOL	0.40 UJ	---	---	5.0 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	0.9	0.8	0.7	0.7		0.30	MMW-13-D01N-GRW, MW-A-T01N-GRW	U CCB-I
Arsenic (P)			3.0			2.3	MMW-10A-T01N-GRW	U CCB-I
Boron (P)	7.4	3.8	3.5		5.8		MMW-10B-T01N-GRW, MMW-10B-D01N-GRW, MMW-13-T01N-GRW, MMW-13-D01N-GRW, MW-20-T01N-GRW, MW-20-D01N-GRW, MW-24-T01N-GRW, MW-24-D01N-GRW, MW-A-T01N-GRW, MW-A-D01N-GRW, RB01T-GRW	U CCB-I U MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P)	0.2					0.2	MMW-13-T01N-GRW, MMW-13-D01N-GRW, MW-20-T01N-GRW	U CCB-I
Molybdenum (P)	-1.7	-1.8	-1.3		-1.22	1.1	MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, MMW-10B-T01N-GRW, MMW-10B-D01N-GRW, MMW-10C-T01N-GRW, MMW-10C-D01N-GRW, MW-20-T01N-GRW, MW-20-D01N-GRW, RB01T-GRW, RB01D-GRW, RB03T-GRW, RB03D-GRW, RB23T-SOL	UJ CCB-L UJ MB-L J CCB-L J MB-L
Potassium (P)		-292.2				201.8 314.1	RB01T-GRW, RB01D-GRW, RB03T-GRW, RB03D-GRW, RB23T-SOL	UJ CCB-L

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Metals and Inorganics

Sample/Analytes	Absolute difference	Higher RL	Action
MMW-10B-T01N-GRW • Orthophosphate Vs. Phosphorus	0.178	0.010	Results for these analytes in the MMW-10B-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
RB03T/D-GRW • Orthophosphate Vs. Phosphorus • Zinc	0.42 201	0.01 39.0	Results for these analytes in the RB03T/D-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
RB01T-GRW • Orthophosphate Vs. Phosphorus	0.025	0.01	Results for these analytes in the RB01T-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
MMW-10A-T01N/D01N-GRW • Nickel	687	340	Results for these analytes in the MMW-10A-T01N/D01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.

Table 1.4
Positive Results for Rinsate Blanks

Analyte	RB01T-GRW (mg/l)	RB03T-GRW (mg/l)	RB03D-GRW (mg/l)	RB23T-SOL (mg/l)
TDS	9.0	7.0	---	---
TSS	0.50	0.50	---	---
Hydroxide Alkalinity	3.2	2.7	---	---

Analyte	RB01T-GRW (mg/l)	RB03T-GRW (mg/l)	RB03D-GRW (mg/l)	RB23T-SOL (mg/l)
Bicarbonate Alkalinity	3.2	2.7	---	---
Total Alkalinity	3.2	2.7	---	---
Ammonia	0.040	0.046	---	0.061
TKN	0.33	---	---	---
Orthophosphate	0.035	0.43	---	---
Analyte	**RB01T-GRW (µg/l)**	**RB03T-GRW (µg/l)**	**RB03D-GRW (µg/l)**	**RB23T-SOL (µg/l)**
Copper	---	---	---	1.8
Calcium	---	---	3660	---
Zinc	---	---	240	---
Acetone	---	---	---	6
Diethylphthalate	0.6	---	---	---
Di-n-butylphthalate	0.5	---	---	---
Bis (2-ethylhexyl) phthalate	---	---	---	0.8

Table 1.5
Positive Results for Field Blanks

Analyte	FB43T-SOL (µg/l)	FB44T-SOL (µg/l)
Bis (2-ethylhexyl) phthalate	1	0.6

Table 1.6
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC ICAL Date/Time	Analyte	|%D| >30%	Action	Qualification and Qualification Codes
1/6/03 (0921)	Benzaldehyde	39.3%	Results for these analytes in associated samples were qualified as estimated.	UJ ICAL-I

Table 1.7
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Samples Qualified	Qualification and Qualification Codes
1/17/03 (2137)	Acetone 2-Butanone 2-Hexanone	45.8% 34.5% 36.8%	RB-01T-GRW TB115-SOL TB127-SOL	UJ CCAL-I

SVOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
1/21/03 (0724)	Benzaldehyde Di-n-octylphthalate	-99.9% -44.9%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I
1/22/03 (0546)	Benzaldehyde Pentachlorophenol Di-n-octylphthalate	35.6% 30.6% -50.5%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT042 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 03/20/03

Peer Reviewer: Alan Roberts Date Completed: 03/27/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RB26T-SOL	RB	515356		W	X	X	X	X			
RB22T-SOL	RB	515357		W	X	X	X	X			
FB46T-SOL	FB	515358		W			X	X			
FB47T-SOL	FB	515359		W			X	X			
TB129-SOL	TB	515360		W			X				
TB130-SOL	TB	515361		W			X				
MMW-48A-T01N-GRW	SA	515431	MMW48AT01NGR	W	X	X	X	X	X		
MMW-48A-D01N-GRW	SA	515432		W	X						
TB123-GRW	TB	515433		W			X				
MMW-32A-T01N-GRW	SA	515434	MMW32AT01NGR	W	X	X			X		
MMW-32A-D01N-GRW	SA	515435		W	X						
MMW-32B-T01N-GRW	SA	515436	MMW32BT01NGR	W	X	X			X		
MMW-32B-D01N-GRW	SA	515437		W	X						
TB101-GRW	TB	515438		W			X				
MMW-43A-T01N-GRW	SA	515439		W	X	X	X	X			
MMW-43A-D01N-GRW	SA	515440		W	X						
MMW-39A-T01N-GRW	SA	515441		W	X	X					
MMW-39A-D01N-GRW	SA	515442		W	X						
MMW-33A-T01N-GRW	SA	515443	MMW33AT01NGR	W	X	X			X		
MMW-33A-D01N-GRW	SA	515444		W	X						
MW-4-T01N-GRW	SA	515445		W	X	X					
MW-4-D01N-GRW	SA	515446		W	X						
MW-7A-T01N-GRW	SA	515447		W	X	X					
MW-7A-D01N-GRW	SA	515448		W	X						

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The samples in this sample delivery group (SDG) were re-analyzed for sulfate by method 375.4. The re-analysis was requested after the analytical holding time had expired. The raw data from the original sulfate analyses by method 300.0, which were performed within the holding time, are provided in the data package. The results from the re-analyses are formally presented in the case submittal. Table 1.1 below summarizes the qualification for sulfate holding time.

The original Total Dissolved Solids (TDS) analysis of sample MMW-39A-T01N-GRW, which was performed within holding time, yielded a net weight after drying that greatly exceeded the upper limit of the method. This sample was re-analyzed using a smaller sample volume outside of holding time yielding results comparable to the original analysis. The results from the re-analysis are formally presented in this case submittal. Table 1.1 summarizes the holding time qualifications.

The ammonia analyses for samples MMW-48A-T01N-GRW, MMW-32A-T01N-GRW, and MMW-32B-T01N-GRW were performed within the prescribed analytical holding time. However, the associated preparation blank contained a concentration greater than the reporting limit and therefore the samples required re-analyses, which were performed 12 days beyond the prescribed holding time. The results from the re-analyses have been formally presented in this case submittal with the data from the original analysis being provided in the raw data section of the data package. Table 1.1 summarizes the holding time qualifications.

The ammonia analysis of sample MW-4-T01N-GRW was accomplished 1 day beyond the prescribed analytical holding time. Table 1.1 summarizes the holding time qualifications.

During the nitrate analysis of the samples in this SDG, the associated blank sample CCB2 yielded a concentration at the reporting limit of 0.2 mg/L. This was discovered during the data review process, well beyond the analytical holding, therefore, the associated samples were not re-analyzed. No qualification of the associated data was considered necessary.

The metals analyses of the samples in this delivery group were performed at the dilution levels established by client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the filed pH determinations

The IPC/MS analyses of several samples in this delivery group yielded percent recoveries of select internal standards that were below the laboratory's control limit of 60%. However, these recoveries were within the limits set forth in method 6020 and the Molycorp RI/FS QAPP. No qualification of the associated data was considered necessary.

A volatile organic holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and is labeled HBW042. The results were all nondetect; therefore there is no evidence of cross-contamination occurring during storage

The pH for the volatile organics analyses of sample MMW-48A-T01N-GRW, TB123-GRW, TB101-GRW, and MMW-43A-T01N-GRW was inadvertently not determined at the time of sample receipt. These samples were re-analyzed within 7 days from the data of sample collection.

Manual integration was employed in deriving results for the volatile and semi-volatile organics analyses in this SDG. The values that have been derived from manual integration are qualified on the quantitation reports and extracted ion current profiles are included in the SDG.

The nitroaromatics analysis of laboratory control samples X7LCS, and X7LCSD yielded a slightly low percent recovery (LCS=65%, and LCSD=65%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time were exceeded by less than 48 hours for nitrate as N, nitrite as N, orthophosphate, the 7 day holding time was exceeded by less than twelve days for TDS, and the 28 day holding time was exceeded by less than eighteen days for sulfate. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, arsenic, boron, beryllium, copper, iron, molybdenum, potassium, sodium, and 1,2,4-trichlorobenzene, methylene chloride, 1,2-dibromo-3-chlororpropane, and diethylpthalate were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKL5. TICs in method blanks are not considered to be reportable as TICs for samples and their identification as TICs was rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	Although serial dilutions tests were conducted for each analyte, the native sample concentration were <50x IDLs. Therefore the serial dilution results are not considered appropriate for assessing interferences. Recovery for internal standards Y was low for the ICPMS analysis of samples RB22T-SOL, MMW-43A-T01N-GRW, and high for MMW-39A-T01N-GRW, and MMW-39A-D01N-GRW. Therefore, all molybdenum samples were reanalyzed and reported by trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Tb was low for the ICPMS analysis of sample MMW-43A-T01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. Recovery for internal standard Li was low for the ICPMS analysis of samples RB22T-SOL, MMW-48A-T01N-GRW, MMW-32B-T01N-GRW MMW-43A-T01N-GRW, MMW-39A-T01N-GRW, MMW-39A-D01N-GRW, and MW-4-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. Recovery for internal standard Tb was high for the ICPMS analysis of samples MMW-38A-T01N-GRW and MMW-38A-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. Recovery for internal standard Sc was low for the ICPMS analysis of samples RB22T-SOL, MMW-48A-T01N-GRW, MMW-32B-T01N-GRW, MMW-43A-T01N-GRW, MMW-39A-T01N-GRW, and MMW-39A-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. Recovery for internal standard In was low for the ICPMS analysis of samples RB22T-SOL, MMW-43A-T01N-GRW, and MMW-39A-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. For sample MW-4-T01N-GRW and MW-7A-T01N-GRW the dissolved concentration of molybdenum and copper exceeded that of the total analysis by more than the acceptance margin. Therefore, they did not meet acceptance criteria. Table 1.3 summarizes these results and the data qualifications. For samples MMW-43A-T01N/D01N-GRW, and MMW-39A-T01N/D01N-GRW, the anion/cation balance was outside acceptance critieria. The percent differences were –33.81 (pH=6.81), and –22.12 (pH=4.22) respectively, outside the acceptance range of ±13%. Evaluations of the historical data relative to the sulfate ion concentration indicates that the sulfate results were likely biased high. Therefore the sulfate results for these samples were qualified as estimated (J). A qualification code of "TvP-H" was assigned.
Field QC • Field Duplicate • Rinsate Blank RB26T-SOL RB22T-SOL • Field Blank FB46T-SOL FB47T-SOL • Trip Blank TB129-SOL TB130-SOL TB123-GRW • Other (e.g., splits)	No	There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.4. The RB results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. There were a few detections in the various field blanks (FB). These are summarized in Table 1.5. The FB results for the Janauary 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The LCS results for explosives were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration Table 1.6 and 1.7 summarizes initial and continuing calibration detections and the resultant data qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS	Ammonia	Sulfate (mg/L)
RB26T-SOL	---	---	---	---	---	5.0 UJ
RB22T-SOL	---	---	---	---	---	5.0 UJ
MMW-48A-T01N-GRW	0.79 J	0.005 UJ	0.058 J	---	0.098 J	2530 J
MMW-32A-T01N-GRW	4.1 J	0.005 UJ	0.010 UJ	---	0.085 J	1690 J
MMW-32B-T01N-GRW	0.56 J	0.005 UJ	0.010 UJ	---	0.070 J	1430 J
MMW-43A-T01N-GRW	0.40 J	0.005 UJ	0.010 UJ	---	---	2580 J
MMW-39A-T01N-GRW	23 J	---	---	5400 J	---	5830 J
MMW-33A-T01N-GRW	4.0 J	0.005 UJ	0.010 UJ	---	---	1220 J
MW-4-T01N-GRW	0.75 J	0.005 UJ	0.010 UJ	--	0.060 J	55.5 J
MW-7A-T01N-GRW	0.47 J	---	---	---	---	930 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	37.4	25.6	-93.6	-193	-189.9		22.6 14.2	MMW-32B-T01N-GRW, MMW-32B-D01N-GRW, MMW-43A-T01N-GRW, MW-4-T01N-GRW, MW-4-D01N-GRW, MW-7A-T01N-GRW, MW-7A-D01N-GRW,	UJ CCB-L
Antimony (MS)	0.9	0.8	0.7	0.7	0.7	-0.72	0.30	MMW-32B-T01N-GRW, MMW-32B-D01N-GRW, MMW-43A-T01N-GRW, MMW-43A-D01N-GRW, MMW-48A-T01N-GRW, MMW-48A-D01N-GRW, MW-4-T01N-GRW, MW-4-D01N-GRW, MW-7A-T01N-GRW, MW-7A-D01N-GRW, RB22T-SOL, RB26T-SOL	UJ MB-L J MB-L
Boron (P)	-3.5 6.0	-11.8	-19.2	-25.4	-24.8 3.8	-5.97	2.7	MMW-32A-T01N-GRW, MMW-32A-D01N-GRW, MMW-32B-T01N-GRW, MMW-32B-D01N-GRW, MMW-33A-T01N-GRW, MMW-33A-D01N-GRW, MMW-39A-T01N-GRW, MMW-39A-D01N-GRW, MMW-43A-T01N-GRW, MMW-43A-D01N-GRW, MMW-48A-T01N-GRW, MMW-48A-D01N-GRW, MW-4-T01N-GRW, MW-4-D01N-GRW, MW-7A-T01N-GRW, MW-7A-D01N-GRW, RB22T-SOL, RB26T-SOL	UJ CCB-L UJ MB-L J CCB-L J MB-L
Beryllium (P)			0.5	1.1	1.1		0.2	MMW-32A-T01N-GRW, MMW-32A-D01N-GRW, MMW-43A-T01N-GRW, MMW-43A-D01N-GRW, MMW-48A-T01N-GRW, MMW-48A-D01N-GRW MMW-33A-T01N-GRW MMW-33A-D01N-GRW	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Copper (P)			-5.5	-10.9 -2.2	-10.4 -3.5		1.7	MMW-32B-T01N-GRW, MMW-32B-D01N-GRW, MMW-43A-T01N-GRW, MMW-43A-D01N-GRW, MMW-48A-T01N-GRW, MMW-48A-D01N-GRW, MW-4-T01N-GRW, MW-4-D01N-GRW, MW-7A-T01N-GRW, MW-7A-D01N-GRW,	UJ CCB-L J CCB-L
Molybdenum (P)	1.5			1.2	1.4		1.1	RB26T-SOL	U CCB-I
Potassium (P)			-1040	-1736 600.7	-1870 562.8	-208.7	314.1 201.8	MW-4-T01N-GRW, MW-4-D01N-GRW, MW-7A-T01N-GRW MW-7A-D01N-GRW MMW-43A-D01N-GRW NNW-43A=T01N-GRW RB22T-SOL, RB26T-SOL	UJ CCB-L J CCB-L UJ MB-L J MB-L

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Metals and Inorganics

Sample/Analytes	Total vs. Partial	RL	Action
MW-4-T01N/D01N-GRW • Molybdenum	13.1/19.7	1.1	Results for these analytes in the MW-4-T01N-GRW and MW-4-D01N-GRWin this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.
Sample/Analytes	**Absolute difference**	**RL**	**Action**
MW-7A-T01N/D01N-GRW • Copper	6.0	1.7	Results for these analytes in the MW-7A-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.

Table 1.4
Positive Results for Rinsate Blanks

Analyte	RB26T-SOL (mg/l)	RB22T-SOL (mg/l)
Ammonia	0.070	0.072
Phosphate	0.014	---
Analyte	**RB26T-SOL (µg/l)**	**RB22T-SOL (µg/l)**
Mercury	---	0.12
Molybdenum	---	1.9
Sodium	---	3390
Acetone	2	---

Analyte	RB26T-SOL (mg/l)	RB22T-SOL (mg/l)
Bis (2-ethylhexyl) phthalate	---	1

Table 1.5
Positive Results for Field Blanks

Analyte	FB46T-SOL (µg/l)	FB47T-SOL (µg/l)
Diethylphthalalte	---	0.6
Bis (2-ethylhexyl) phthalate	0.8	0.8

Table 1.6
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC ICAL Date/Time	Analyte	RSDs >30%	Action	Qualification and Qualification Codes
01/06/03 (0921)	Benzaldehyde	39.3%	RB26T-SOL, RB22T-SOL, FB46T-SOL, FB47T-SOL, MMW-48A-T01N-GRW, MMW-43A-T01N-GRW	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.7
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
01/22/02 (0546)	Benzaldehyde Pentachlorophenol Di-n-octylphthalate	35.6% 30.6% -50.5%	RB26T-SOL, RB22T-SOL, FB46T-SOL, FB47T-SOL	UJ CCAL-I
01/24/03 (1353)	Benzaldehyde 2,4-Dinitrophenol 4-Nitrophenol Di-n-octylphthalate	39.8% -34.3% -28.1% -53.2%	MMW-48A-T01N-GRW, MMW-43A-T01N-GRW	UJ CCAL-I

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT043 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Ansley Watson Date Completed: 03/20/03

Peer Reviewer: Stacey Coker Date Completed: 03/27/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
TB111-SOL	TB	515449		W			X				
RB24T-SOL	RB	515450		W	X	X	X	X			
RB25T-SOL	RB	515451		W	X	X	X	X			
TB114-SOL	TB	515452		W			X				
FB50T-SOL	FB	515453		W			X	X			
RB28T-SOL	RB	515454		W	X	X	X	X		X	
TB101-SOL	TB	515456		W			X				
RB27T-SOL	RB	515457		W	X	X	X	X		X	
TB120-SOL	TB	515458		W			X				
FB48T-SOL	FB	515459		W					X		
FB49T-SOL	FB	515460		W			X	X		X	
RB30T-SOL	RB	515461		W	X	X	X	X	X	X	
TB121-SOL	TB	515462		W			X				
RR-14-T01N-SFW	SA	515625		W	X	X					X
RR-14-D01N-SFW	SA	515626		W	X						
RR-12-T01N-SFW	SA	515627		W	X	X					X
RR-12-D01N-SFW	SA	515628		W	X						
MW-11-T01N-GRW	SA	515629		W	X	X					
MW-11-D01N-GRW	SA	515630		W	X						
MW-12-T01N-GRW	SA	515631		W	X	X					
MW-12-D01N-GRW	SA	515632		W	X						
TB135-GRW	TB	515633		W			X				
COLUMBINE1-T01N-GRW	SA	515634	COLUMBINE1 or COLUMBINE1T0	W	X	X	X	X	X		
COLUMBINE1-D01N-GRW	SA	515635		W	X						
RR-13-T01N-SFW	SA	515636		W	X	X					X
RR-13-D01N-SFW	SA	515637		W	X						
RR-13-T01D-SFW	FD	515638		W	X	X					X
RR-13-D01D-SFW	FD	515639		W	X						
MW-2-T01N-GRW	SA	515640		W	X	X					
MW-2-D01N-GRW	SA	515641		W	X						

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

During the anion/cation balance data review process it was noted that all of the samples in this sample delivery group (SDG) exhibited ion balance percent differences that were within the validation limits with the exception of location MW-2, with a percent difference outside the limits. This sample was re-analyzed for Sulfate bringing the percent difference within he acceptable range. Also, the ratios of calculated versus measured TDS were within limits of 0.5-1.5 used for the evaluation for all samples, including MW-2 after using the results from the Sulfate re-analysis. No qualification of the associated data was considered necessary.

Due to a malfunction in the STL Burlington Total Organic Carbon (TOC) instrument, the samples in this SDG had to be analyzed at the STL Austin, Texas laboratory. The data package provided by STL Austin is included at the end of this submittal.

The samples in this SDG were re-analyzed for sulfate by method 375.4. The re-analysis was requested after the analytical holding time had expired. The raw data from the original sulfate analyses by method 300.0, which were performed within the holding time, are provided in the data package. The results from the re-analyses are formally presented in the case submittal. Table 1.1 below summarizes the qualification for sulfate holding time.

The metals analyses of the samples in this SDG were performed at the dilution levels established by client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the filed pH determinations

Selected surface water samples reported in this package were reanalyzed for dissolved aluminum, dissolved arsenic, and dissolved cadmium without dilution in order to achieve lower reporting limits to meet project objectives. The results for the re-analysis were reported in three data packages: WATRAS1, WATRAS2, and WATRAS3. Each package was reviewed in accordance with SOP 12.1. The results of the review are reported in separate data review narrative summaries. In all cases, the results for the re-analysis have been annotated to indicate which results were selected for reporting. The associated Data Validation Report for each sampling event affected contains further details.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time limit was exceeded by less than 48 hours for nitrate as N, nitrite as N, orthophosphate, and BOD, and the 28 day holding time limit was exceeded by less than eighteen days for sulfate. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, boron, iron, molybdenum, 1,2-Dibromo-3-chloropropane, 1,2,4-Trichlorobenzene, and Methylene Chloride were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In all cases, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/ MSD/PDS RR-14-T01N-SFW	Yes	Matrix spike analyses were conducted on samples RR-14-T01N-SFW, and RR-14-T01N-SFW. Four matrix spike results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
RR-14-D01N-SFW • LD RR-14-T01N-SFW		For matrix spike analysis on samples RR-14-T01N-SFW, and RR-14-T01N-SFW the recoveries of sulfate and iron were low. Similarly, the recoveries of iron and nitrite were high. Table 1.3 summarizes these matrix spike results. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-14-T01N-SFW RR-14-D10N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery for the semi-volatile organic compound (SVOC) analysis was high in sample RB28T-SOL. The recoveries of Phenol-d5 (123%), 1,2-dichlorobenzene-d4 (118%), and Terphenyl-d14 (160%). These recoveries are outside the acceptance ranges of 10-110%, 16-110%, and 33-141%, respectively, suggesting a potential high bias in the associated sample results. Because the surrogate recovery is greater than the acceptance limit, all SVOC positive results for sample RB01T-GRW were qualified as estimated "J", whereas nondetect results are considered to be acceptable for use without qualification. The serial dilution analyses on samples RR-14-T01N-GRW and RR-14-D01N-GRW, both pH class C, (generally for ICPMS metals) was applicable for 3 out of 24 analytes.
Field QC • Field Duplicate • Rinsate Blank RB24T-SOL RB25T-SOL RB28T-SOL RB27T-SOL RB30T-SOL • Field Blank FB50T-SOL FB48T-SOL FB49T-SOL • Trip Blank TB111-SOL TB114-SOL TB101-SOL TB120-SOL TB121-SOL TB135-GRW • Other (e.g., splits)	No	There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.4. The RB results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. There were a few detections in the various field blanks (FB). These are summarized in Table 1.5. The FB results for the Janaury 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	No	The relative response factor for the series of calibration standards for benzaldehyde exceeded the maximum % relative standard deviation of 30% for SVOC. Table 1.6 summarizes the initial calibration results that were outside the evaluation criteria and any resultant data qualification issues.
Continuing Calibration	No	The relative response factor for the series of calibration standards for exceeded the maximum % difference of 25%. Table 1.7 summarizes the continuing calibration results that were outside the evaluation criteria and any resultant data qualification issues.
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	No	The semivolatile analysis of laboratory control samples L5LCS yielded a slightly high percent recovery of the target compound 4-Nitrophenol (LCS=92%). The CLP method does not require the blank spike to be analyzed for the semivolatile organic compounds; however, the laboratory did report these values along with their historical QC limits of 4-Nitrophenol (10-80%). The blank spike in this analytical set is actually at a higher or equivalent accuracy than the historical QC limits. Accuracy of 4-Nitrophenol (92%) is considered acceptable; therefore no qualifications are necessary. The nitroaromatics analysis of laboratory control samples X7LCS, X7LCSD, Z2LCSand Z2LCSD yielded a slightly low percent recovery (X7LCS=65%, X7LCSD=65%, Z2LCD=60%, and Z2LCSD=55%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J). The pesticides/PCB analysis of laboratory control samples Q1LCS, Q1LCSD, Q7LCS, and Q7LCSD yielded a slightly high percent recovery of the target compounds Endrin (Q1LCS=130%, Q1LCSD=140%, Q7LCS=130%, and Q7LCSD=130%), and 4,4'-DDT (Q1LCSD=130%). The CLP method does not require the blank spike to be analyzed for the pesticides/PCB, however, the laboratory did report these values along with their historical QC limits of Endrin (56-121%), and 4,4'-DDT (3-127%). The blank spike in this analytical set is actually at a higher or equivalent accuracy than the historical QC limits. Accuracy of Endrin (130%, 140%, 130% and 130%), and 4,4'-DDT (130%) are considered acceptable; therefore no qualifications are necessary.
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	BOD	Sulfate (mg/L)
RB24T-SOL	0.40 UJ	---	---	---	5.0 UJ
RB25T-SOL	0.40 UJ	---	---	---	5.0 UJ
RB28T-SOL	---	---	---	---	5.0 UJ
RB27T-SOL	0.40 UJ	---	---	---	---
RR-14-T01N-SFW	0.96 J	0.005 UJ	0.010 UJ	1.5 UJ	185 J
RR-12-T01N-SFW	0.95 J	---	---	1.5 UJ	155 J
MW-11-T01N-GRW	0.64 J	0.005 UJ	0.036 J	---	107 J
MW-12-T01N-GRW	0.54 J	0.005 UJ	0.020 J	---	40.8 J
COLUMBINE1-T01N-GRW	2.2 J	---	---	---	804 J
RR-13-T01N-SFW	1.0 J	---	---	1.5 UJ	152 J
RR-13-T01D-SFW	9.8 J	---	---	1.5 UJ	162 J
MW-2-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ	---	433 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)		27.7		23.5			22.6	RR-12-T01N-SFW, RR-13-T01N-SFW, RR-13-T01D-SFW	U CCB-I
Antimony (MS)	2.2	2.1	1.8	1.9	2.0	1.7	0.3	MW-12-D01N-GRW, RB24T-SOL, RB25T-SOL, RB27T-SOL, RR-12-T01N-SFW, RR-14-D01N-SFW	U CCB-I U MB-I
Boron (P)	6.0	4.6			5.3		2.7	MW-12-T01N-GRW, MW-12-D01N-GRW, MW-2-T01N-GRW, MW-2-D01N-GRW, RR-12-T01N-SFW, RR-12-D01N-SFW, RR-13-T01N-SFW, RR-13-D01N-SFW, RR-13-T01D-SFW, RR-13-D01D-SFW, RR-14-T01N-SFW, RR-14-D01N-SFW	U CCB-I
Iron (P)		27.5		29.6	32.3		26.6	MW-2-D01N-GRW, RR-14-T01N-SFW	U CCB-I
Molybdenum (P)			1.3				1.1	MW-12-T01N-GRW, MW-12-D01N-GRW, RB30T-SOL, RR-12-T01N-SFW, RR-12-D01N-SFW, RR-13-T01N-SFW, RR-13-D01N-SFW,	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
								RR-13-T01D-SFW, RR-13-D01D-SFW, RR-14-T01N-SFW, RR-14-D01N-SFW	

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Qualifications for Metals and Inorganics

Analyte	MS%R	PDS %R	Criteria	Comment	Action
RR-14-T01N-SFW					
Nitrite as N	128.6	NA	75-125%	Parent sample is nondetect	No qualification
Sulfate	66	NA		NONE	J MS-L parent
Iron	73.2	97.8		NONE	J MS-L parent
RR-14-D01N-SFW					
Iron	125.7	102.8	75-125%	Parent sample is nondetect	No qualification

Table 1.4
Positive Results for Rinsate Blanks

Analyte	RB24T-SOL (µg/l)	RB25T-SOL (µg/l)	RB28T-SOL (µg/l)	RB27T-SOL (µg/l)	RB30T-SOL (µg/l)
Ammonia	0.058	0.065	0.066	0.067	0.081
Chloride	---	---	---	0.49	0.49
Phosphorus	---	0.015	---	---	---
Antimony	---	---	2.2	---	---
Acetone	4	3	---	---	6
Carbon Disulfide	3	---	---	---	---
Di-n-butylphthalate	---	---	---	0.5	---
Bis (2-ethylhexyl) phthalate	---	---	---	1	---

Table 1.5
Positive Results for Field Blanks

Analyte	FB48T-SOL (µg/l)	FB49T-SOL (µg/l)	FB50T-SOL (µg/l)
Chloroform	---	---	8
Di-n-butylphthalate	1	---	---
Bis (2-ethylhexyl) phthalate	1	0.8	1

Table 1.6
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC ICAL Date/Time	Analyte	RSDs >30%	Action	Qualification and Qualification Codes
01/06/03 (0921)	Benzaldehyde	39.3%	COLUMBINE1-T01N-GRW, RB27T-SOL, FB48T-SOL, RB30T-SOL, RB24T-SOL, RB25T-SOL, FB50T-SOL, RB28T-SOL	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.7
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
1/20/03 (2107)	Acetone 2-Butanone 2-Hexanone	43.4% 31.0% 34.6%	TB101-SOL, RB27T-SOL, TB120-SOL, FB48T-SOL, FB49T-SOL, RB30T-SOL, TB121-SOL	UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
01/24/03 (1353)	Benzaldehyde 2,4-Dinitrophenol 4-Nitrophenol Di-n-octylphthalate	39.8% -34.3% -28.1% -53.2%	COLUMBINE1-T01N-GRW RB27T-SOL, RB24T-SOL, FB48T-SOL, FB49T-SOL, RB30T-SOL	UJ CCAL-I
01/27/03 (1353)	Benzaldehyde 3-Nitroaniline 4-Nitroaniline Carbazole 3,3'-Dichlorobezidine Di-n-octylphthalate	42.8% 30.1% 45.2% 28.0% 31.4% -47.3%	RB25T-SOL, FB50T-SOL, RB28T-SOL	UJ CCAL-I

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT044 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 03/11/03

Peer Reviewer: Alan Roberts/Stacey Coker Date Completed: 03/25/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
RR-16-T01N-SFW	SA	515694		W	X	X					
RR-16-D01N-SFW	SA	515695		W	X						
MW-15-T01N-GRW	SA	515696		W	X						
MW-15-D01N-GRW	SA	515697		W	X	X					
MW-CH-T01N-GRW	SA	515698	MWCHT01N-GRW	W	X	X	X	X			
MW-CH-D01N-GRW	SA	515699		W	X						
TB133-GRW	TB	515700		W			X				
TB132-SOL	TB	515701		W			X				
FB50T-SOL	FB	515702		W			X	X			X
FB51T-SOL	FB	515703		W			X	X			X
FB52T-SOL	FB	515704		W			X	X			X
MW-7C-T01N-GRW	SA	515705		W	X	X					
MW-7C-D01N-GRW	SA	515706		W	X						
EW-5C-T01N-GRW	SA	515707		W	X	X					
EW-5C-D01N-GRW	SA	515708		W	X						
MW-B-T01N-GRW	SA	515709		W	X	X					
MW-B-D01N-GRW	SA	515710		W	X						
TB134-SOL	TB	515711		W			X				
RB32T-SOL	RB	515712		W	X	X	X	X			X
RB33T-SOL	RB	515713		W	X	X	X	X			X
TB138-SOL	TB	515714		W			X				
FB53T-SOL	FB	515715		W			X	X			X
FB54T-SOL	FB	515716		W			X	X			X
FAGERWELL-T01N-GRW	SA	515795	FAGERWELLT01	W	X	X			X		
FAGERWELL-D01N-GRW	SA	515796		W	X						
RR-11C-T01N-SFW	SA	515797		W	X	X					
RR-11C-D01N-SFW	SA	515798		W	X						
RR-10A1-T01N-SFW	SA	515799		W	X	X					
RR-10A1-D01N-SFW	SA	515800		W	X						

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

As requested, the samples in this delivery group were re-analyzed for sulfate by method 375.4. This request and subsequent re-analysis occurred after the holding time had expired. Raw data from the original sulfate analyses (method 300.0) were performed within the holding time and presented in the data package. The results for the re-analyses were formally presented in this data package. Qualifications based on sulfate holding time exceedances are described in Table 1.1.

The original TKN analysis of sample MW-B-T01N-GRW was accomplished within the prescribed analytical holding time. The laboratory case narrative noted the associated blank spike analysis exhibited an elevated percent recovery and subsequently was re-analyzed 8 days beyond the prescribed holding time. Upon further inspection into the raw data sheets, it was determined that the percent recovery for TKN of the blank spike sample (LCS) was 104.5%, and therefore not outside of the range established by the lab or set forth by the QAPP. It cannot be discerned from the raw data sheets why the analysis was rerun. The laboratory has been contacted about this matter.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile organic holding blank was carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and labeled HBW044. All results for HBW044 were nondetect, as such, it is unlikely that any cross-contamination resulted from sample storage.

Manual integration was employed in deriving results for the volatile and semi-volatile organics analyses in this SDG. The values that have been derived from manual integration are qualified on the quantitation reports and extracted ion current profiles are included in the SDG.

The laboratory case narrative noted the nitroaromatic analysis of the blank spike samples with this delivery group yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded recoveries below the default control limits. The laboratory has not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J), with a low bias direction.

The pesticide/PCB analysis of the blank spike samples associated with this delivery group yielded percent recoveries for several pesticides that exceeded control criteria. No target analytes were detected in any of the associated field samples above the reporting limit, and therefore did not require qualification.

Selected surface water samples reported in this package were reanalyzed for dissolved aluminum, dissolved arsenic, and dissolved cadmium without dilution in order to achieve lower reporting limits to meet project objectives. The results for the re-analysis were reported in three data packages: WATRAS1, WATRAS2, and WATRAS3. Each package was reviewed in accordance with SOP 12.1. The results of the review are reported in separate data review narrative summaries. In all cases, the results for the re-

analysis have been annotated to indicate which results were selected for reporting. The associated Data Validation Report for each sampling event affected contains further details.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The log-in sheet noted the semivolatile organics (SVOCs) analysis was not checked on the COC for sample RB33T-SOL, although the sample label indicated that the analysis should be conducted. The sample was logged in and analyzed for SVOCs.
Holding Times	No	Several samples in this delivery group were received outside or at the end of the prescribed analytical holding time of 48 hours from the date of sample collection for the nitrite, orthophosphate, and nitrate analyses. Several nitrite, orthophosphate, and nitrate results were less than 48 hours outside the holding time and were subsequently qualified as estimated (J/UJ). One sample for the analysis of total kjeldahl nitrogen (TKN) and one sample for biological oxygen demand (BOD5) were accomplished beyond their prescribed analytical holding time of 28 days and 48 hours by 8 days and one day, respectively. As a result, the affected samples were qualified as estimated (J/UJ). All sulfate analyses were run 8-11 days beyond their prescribed 28-day hold time. Subsequently, all sulfate results were qualified as estimated (J/UJ). Table 1.1 summarizes the holding time exceedances and the resultant data qualifications. The associated bias direction for these results qualified on the basis of holding times is indeterminate.
Method Blanks	No	Several analytes were detected in the volatile and semivolatile blanks. Some tentatively identified compounds were reported as present as well. No volatile data were qualified on the basis of method blank due to the fact that all results were nondetect for all volatile samples. Table 1.2a summarizes the semivolatile blanks detections and resultant data qualifications (limited to those analytes and samples requiring qualification). Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2b summarizes the blank detections and the resultant data qualifications. In all cases, the result was qualified as nondetect at the reported value.
Matrix QC • MS • MS/MSD • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • RR-16-T01N-SFW (C) • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample RR-16-T01N-SFW was not applicable for 24 of the 24 metal analytes, as none of the initial sample results were sufficiently larger (50x) than the IDL, adjusted for dilution. The serial dilution analysis was not useful for evaluating whether significant physical or chemical interferences existed due to the sample matrix. The surrogate recovery for the explosive analysis was low in blank sample EBLKZ2. The recovery of 1,2-dinitrobenzene was 83%. This recovery is outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. No qualification of data was necessary due to the fact that this was a blank sample and all results were nondetect. The system monitoring compound (surrogate) 1,2-Dichloroethane-d4 (DCE) was recovered in the holding blank HBW044 at 115% and in sample MW-CH-T01N-GRW at 114%. In addition this compound was recovered in one trip blanks (TB133-GRW @ 119%), and in two field blanks (FB51T-SOL @ 117% and FB53T-SOL @ 115%). These recoveries fall outside the acceptance range of 76-114%. Due to the fact that no target analytes were detected in the blanks or sample MW-CH-T01N-GRW, data qualification was not necessary. The orthophosphate concentrations of 0.59 mg/L in sample EW-5C-T01N-GRW and 0.13 mg/L in sample MW-15-T01N-GRW were greater than their phosphorus concentrations of 0.034 mg/L and 0.032 mg/L respectively. Due to the fact that both

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		partial and total concentrations for both samples did not exceed 5x the RL (in the first sample 0.02mg/L and 0.01mg/L in the later), the absolute difference between the partial and total results were compared to an evaluation criterion of ±2x RL. The orthophosphate and phosphorus results for samples EW-5C-T01N-GRW and MW-15-T01N-GRW were qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion and subsequently did not require data qualification.
Field QC • Field Duplicate • Rinsate Blank RB32T-SOL (1/19/03) RB33T-SOL (1/19/03) • FieldBlank FB50T-SOL (1/19/03) FB51T-SOL (1/19/03) FB52T-SOL (1/1/9/03) FB53T-SOL (1/19/03) FB54T-SOL (1/19/13) • TripBlank TB133-GRW (1/19/03) TB132-SOL (1/19/03) TB134-SOL (1/19/03) TB138-SOL (1/19/03)	NA	No analytes were detected in any of the five field blanks or four trip blanks reported in this data package, with the exception of the same tentatively identified compound as detected in the method blank. Table 1.3b summarizes analytes detected in the rinsate blanks. The Field QC results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The LCS results for explosives were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TKN	Sulfate (mg/L)	BOD5
RR-16-T01N-SFW	1.0 J	---	---	---	186 J	1.5 UJ
MW-15-T01N-GRW	0.0050 UJ	0.40 UJ	0.13 J	---	1070 J	---
MW-CH-T01N-GRW	0.0050 UJ	0.52 J	0.018 J	---	41.7 J	---
MW-7C-T01N-GRW	0.0050 UJ	0.44 J	0.035 J	---	961 J	---
EW-5C-T01N-GRW	0.0050 UJ	0.40 UJ	0.059 J	---	961 J	---
MW-B-T01N-GRW	0.013 J	0.40 UJ	0.010 UJ	3.1 J	759 J	---

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TKN	Sulfate (mg/L)	BOD5
RB32T-SOL	---	0.40 UJ	---	---	5.0 UJ	---
RB33T-SOL	---	0.40 UJ	---	---	5.0 UJ	---
FAGERWELL-T01N-GRW	---	---	---	---	9.9 J	---
RR-11-T-1N-SFW	---	---	---	---	186 J	---
RR-10A1-T01N-SFW	---	---	---	---	103 J	---

Table 1.2a
Semivolatile Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (µg/kg)	Samples Qualified	Qualification and Qualification Codes
SBLKL5	01/24/03	2-Pentanone,4-Hydroxy-4-Meth[12]	5 NJA	FB50T-SOL FB51T-SOL FB52T-SOL FB53T-SOL FB54T-SOL MW-CH-T01N-GRW RB32T-SOL RB33T-SOL	R
		2-Propanol, 1-[2-(2-Methoxy-[1]	3 NJ	FB53T-SOL	R

[1]Compound is a tentatively identified compound (TIC). TICs in method blanks are not considered to be reportable as TICs for samples.
[2]Compound is a suspected aldol condensation product of acetone.
Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2b
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	51.5	30.1	29.9	33.4 -28.5	-40.5	14.2	14.2	RR-10A1-T01N-SFW RR-11C-T01N-SFW	U CCB-I
Antimony (P)	1.6	1.4	1.4	1.4	---	0.60	0.3	RR-16-T01N-SFW	U CCB-I
Iron (P)	39.9	28.2	---	---	---	48.9	48.9	RR-16-T01N-SFW MW-CH-T01N-SFW FAGERQUIST-T01N-GRW RR-10A1-T01N-GRW	U CCB-I
Molybdenum(P)	---	---	---	1.2	---	1.4	1.1	FAGERWELL-D01N-GRW FAGERWELL-T01N-GRW MW-15-D01N-GRW MW-CH-D01N-GRW MW-CH-T01N-GRW RR-10A1-D01N-GRW RR-10A1-T01N-GRW RR-11C-D01N-SFW RR-11C-T01N-SFW RR-16-D01N-SFW RR-16-T01N-SFW	U MB-I
Sodium (P)	504.4	---	348.3	---	---	618.0	327.4	RR-16-T01N-SFW RR-16-D01N-SFW RR-11C-T01N-SFW	

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
								RR-11C-D01N-SFW RR-10A1-T01N-SFW RR-10A1-D01N-SFW FAGERQUIST-T01N-GRW FAGERQUIST-D01N-GRW	U MB,CCB-I

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Field Quality Control Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB32T-SOL	01/19/03	Chromium	9.7	3.7
		Ammonia-nitrogen	0.059	0.040
		Total organic carbon	1.4	1.0
		Methylene chloride	0.002	0.010
RB33T-SOL	01/19/03	Carbon disulfide	0.003	0.010
		Bis(2-Ethylhexyl)phthalate	0.0009	0.010
		Ammonia-nitrogen	0.043	0.040
		Phosphorus	0.011	0.010
FB50T-SOL	01/19/03	Di-n-butylphthalate	0.0005	0.010

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT045 Sampling Event: January 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 03/14/03

Peer Reviewer: Alan Roberts Date Completed: 03/26/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	BOD/COD	Cyanide
CAPULINSPRGR-T01N-GRW	SA	515890	CAPULINSPRG-T01N-GRW	W							X
GOATHILLSPRGR-T01N-GRW	SA	515891	GOATHILL SPRGR-T01N-GRW	W							X
SPRING13R-T01N-GRW	SA	515892	SPRING13R-T01N-GRW	W							X
LOWERSPRING13R-T01N-GRW	SA	515893	LOWERSPRING13R-T01N-GRW	W							X
SPRING14MR-T01N-GRW	SA	515894	SPRING14MR-T01N-GRW	W							X
RR-11A1-T01N-GRW	SA	515895		W	X	X				X	
RR-11A1-D01N-GRW	SA	515896		W	X						
RR-7-T01N-GRW	SA	515897		W	X	X				X	
RR-7-D01N-GRW	SA	515898		W	X						
RR-10-T01N-GRW	SA	515899		W	X	X				X	
RR-10-D01N-GRW	SA	515900		W	X						
FAGERWELL-T01D-GRW	FD	515901	FAGERWELL-T01D-GRW or FAGERWELLT01	W	X	X			X		
FAGERWELL-D01D-GRW	FD	515902	FAGERWELL-D01D-GRW	W	X						
RB01T-SFW	RB	515903		W	X	X				X	
DOUGLASWELL-T01N-GRW	SA	516099	DOUGLASWELL-T01N-GRW or DOUGLASWELLT	W	X	X					
DOUGLASWELL-D01N-GRW	SA	516100	DOUGFLASWELL-D01N-GRW	W	X				X		

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_____ Data are usable with qualification (noted below).

__X__ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The Total Organic Carbon (TOC) analysis by method 9060 was subcontracted to SRL's Austin, Texas facility. This method was subcontracted due to a malfunction of the laboratory's TOC instrument, which could not be corrected within the analytical holding time of the samples in this delivery group. The data package provided by STL-Austin was included at the end of the submittal. No qualification of the associated data was considered necessary.

The samples in this sample delivery group (SDG) were re-analyzed for sulfate by method 375.4. The re-analysis was requested after the analytical holding time had expired. The raw data from the original sulfate analyses by method 300.0, which were performed within the holding time, are provided in the data package. The results from the re-analyses are formally presented in the case submittal. Table 1.1 below summarizes the qualification for sulfate holding time.

During the TKN analyses performed 2/14/03 and 2/20/03, the low level spike analyses designated LCS1 exhibited percent recoveries that exceeded control criteria. However, the low level blank spike analyses designated LCS2 exhibited acceptable recoveries. The analyses of the associated field sample yielded no TKN concentrations greater then the reporting limit, therefore no qualifications were considered necessary.

The metals analyses in this SDG were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of samples, which were determined by the field pH determinations.

It was noted in the laboratory case narrative that the nitroaromatics analysis of laboratory control samples D1LCS and D1LCSD yielded a slightly low percent recovery (LCS=60%, LCSD=55%) of the target compound PYX. The laboratory has not established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Selected surface water samples reported in this package were reanalyzed for dissolved aluminum, dissolved arsenic, and dissolved cadmium without dilution in order to achieve lower reporting limits to meet project objectives. The results for the re-analysis were reported in three data packages: WATRAS1, WATRAS2, and WATRAS3. Each package was reviewed in accordance with SOP 12.1. The results of the review are reported in separate data review narrative summaries. In all cases, the results for the re-analysis have been annotated to indicate which results were selected for reporting. The associated Data Validation Report for each sampling event affected contains further details.

During the data review process, it was observed that the analytical results presented for barium and beryllium for samples DOUGLASWELL-T01N-GRW and DOUGLASWELL-D01N-GRW were approximately ten times higher than historical data. The data was reviewed by the laboratory to determine the cause for these anomalous results. Based on the review of the multiple analytical sequences, it was determined that the likely cause for the discrepancy was that a dilution factor of ten was inadvertently and incorrectly applied during the ICP 4 analysis on 02/26/03 resulting in an elevation of the final results presented by a factor of ten. In addition to barium and beryllium, this error affected

antimony, arsenic, boron, and molybdenum, as these were originally reported from this run. The decision was made to re-process the data for the above mentioned elements from the ICP/MS analysis on 02/24/03. It is noted that the internal stand Yttrium (associated with the reporting of beryllium and molybdenum) exhibited slightly elevated percent recoveries. As such, detected beryllium results for both samples reported from the ICPMS were qualified as estimated (J), with a high bias direction assigned. The original results for all of the elements listed above were rejected on the basis of disagreement with historical results ("Hist") and data comparability ("DC"), with high bias directions assigned. Additionally, it is noted that at the time that these samples were analyzed, the laboratory had not generated an Instrument Detection Limit (IDL) value for boron for the ICP/MS. Therefore, boron is reported to the reporting limit (RL) versus the IDL for these two samples. To facilitate the ease of presenting these revised results, the laboratory re-generated the Form 1's for samples DOUGLASWELL-T01N-GRW and DOUGLASWELL-D01N-GRW (pages 0404 and 0405) to show all elements except the six being re-processed. The laboratory then provided an additional forms (pages 0504A – 0504M) to present the re-processed results. The supplemental data was collated into the original data package.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were problems noted with sample receipt. • It was determined after shipment that the field sample recorded on the COC as FAGERQUISTWELL-T01N-GRW and FAGERQUISTWELL-D01N-GRW collected on 1/23/03 should have been recorded as DOUGLASWELL-T01N-GRW and DOUGLASWELL-D01N-GRW. The laboratory was notified by fax and the sample was logged in with the correct ID. • CAPULINSPRINGR-T01N-GRW, GOATHILLSPRINGR-T01N-GRW, LOWERSPRING13R-T01N-GRW, and FAGERQUISTWELL-T01D-GRW were truncated to CAPULINSPRGR-T01N-GRW, GOATHILLSPRGR-T01N-GRW, LOWERSPRG13R-T01N-GRW, and FAGERWELL-T01D-GRW. • The laboratory noted that several samples for cyanide analysis were received at an improper pH, which may have resulted in possible loss of cyanide. The affected samples areCAPULINSPRGR-T01N-GRW, and GOATHILLSPRG-T01N-GRW. The nondetect results were qualified as estimated (UJ). The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	The 48-hour holding time were exceeded by less than 48 hours for nitrate as N, nitrite as N, orthophosphate, BOD, and the 28 day holding time were exceeded by less than eight days for sulfate. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, arsenic, boron, iron, and nickel were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In all cases, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Not Applicable	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution RR-11A1-T01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses on sample RR-11A1-T01N-SFW, pH class C, (generally for trace ICP metals) was applicable for 0 out of 24 analytes. Recovery for internal standard Y was high for the ICPMS analysis of samples DOUGLASWELL-T01N-GRW and DOUGLASWELL-D01N-GRW. Beryllium and molybdenum results were originally reported from the ICP run sequence. However, as the original results for these two analytes were rejected (as described in the case narrative section of this report) and reported from the ICP/MS sequence, positive results for beryllium for both samples were qualified as estimated (J) with a high bias direction assigned. Recovery for internal standard Li was high for the ICPMS analysis of sample RB01T-SFW. Therefore, potassium results for all samples were reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate FAGERWELL-T01D-GRW FAGERWELL-D01D-GRW • Rinsate Blank RB01T-SFW • Field Blank • Trip Blank • Other (e.g., splits)	No	There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.3. The RB results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The LCS results for explosives were reviewed as summarized in the case narrative section.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite as N	Orthophosphate	BOD	Sulfate
RR-11A1-T01N-GRW	0.86 J	0.005 UJ	0.010 UJ	1.3 UJ	85.6 J
RR-7-T01N-GRW	---	0.005 UJ	0.010 UJ	1.3 UJ	109 J
RR-10-T01N-GRW	0.80 J	0.005 UJ	0.010 UJ	1.3 UJ	104 J
FAGERWELL-T01D-GRW	0.40 U	0.005 UJ	0.010 UJ	---	10.5 J
RB01T-SFW	0.40 U	0.005 UJ	0.010 UJ	1.3 UJ	5.0 UJ
DOUGLASWELL-T01N-GRW	1.9 J	---	---	---	644 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	SamplesQualified	Qualification Code
Antimony (MS)	1.4	1.2	1.2	---	---	3.195		RR-11A1-T01N-GRW	U CCB-I U MB-I
Arsenic (P)	---	6.2	2.4	---	3.0	---		DOUGLASWELL-D01N-GRW DOUGLALWELL-T01N-GRW	U CCB-I
Iron (P)	41.0	---	---	---	--	---		RR-11A1-T01N-SFW RR-7-T01N-SFW	U CCB-I
Boron (P)	8.2	4.3	3.6	3.7	7.0	5.884		DOUGLASWELL-D01N-GRW DOUGLALWELL-T01N-GRW FAGERWELL-T01D-GRW, FAGERWELL-D01D-GRW, RR-10-T01N-GRW, RR-10-D01N-GRW, RR-11A1-T01N-GRW, RR-11A1-D01N-GRW, RR-7-T01N-GRW, RR-7-D01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Positive Results for Rinsate Blanks

Analyte	Sample (µg/l)
	RB01T-SFW
Bicarbonate Alkalinity	0.093
Total Alkalinity	0.28
Ammonia	0.091

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: TDSRA1 Sampling Event: April 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 07/10/03

Peer Reviewer: Stacey Coker Date Completed: _____

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analysis: Metals
LABWELL-T01N-GRW	SA	521414		W	X
COLUMBINE NO #2-T01N-GRW	SA	521415		W	X
MW-17-T01N-GRW	SA	521416		W	X
MMW-31A-T01N-GRW	SA	521417		W	X
MMW-42A-T01N-GRW	SA	521418		W	X
MMW-28A-T01N-GRW	SA	521419		W	X
MMW-28B-T01N-GRW	SA	521420		W	X
SPRING12-T01N-GRW	SA	521421		W	X
SPRING18-T01N-GRW	SA	521422		W	X
P-2-T01N-GRW	SA	521423		W	X
US-2-T01N-GRW	SA	521424		W	X
US-2-T01D-GRW	FD	521425		W	X
SPRING14T-T01N-GRW	SA	521426		W	X
SPRING15-T01N-GRW	SA	521427		W	X
MMW-19A-T01N-GRW	SA	521428		W	X
SPRING9-T01N-GRW	SA	521429		W	X
SPRING10-T01N-GRW	SA	521430		W	X
RB04T-GRW	RB	521430		W	X

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For all the packages in this SDG the 8-day holding time was exceeded for TDS by 1-5 days. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	Yes	
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • RR-US-SPRG13-T01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample RR-US-SPRG13-T01N-SFW, pH class C, was applicable for 0 out of 24 analytes. Recovery for internal standard Y was high for the ICPMS analysis of samples SPRING13-T01N-GRW, and SPRING13-D01N-GRW. Therefore, the molybdenum results for these samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate (FD) US-2-T01D-GRW • Rinsate Blank (RB) RB04T-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any site-specific field quality control samples. The field quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	TDS (mg/L)
LABWELL-T01N-GRW	
COLUMBINE NO #2-T01N-GRW	
MW-17-T01N-GRW	
MMW-31A-T01N-GRW	
MMW-42A-T01N-GRW	
MMW-28A-T01N-GRW	
MMW-28B-T01N-GRW	
SPRING12-T01N-GRW	
SPRING18-T01N-GRW	
P-2-T01N-GRW	
US-2-T01N-GRW	
US-2-T01D-GRW	
SPRING14T-T01N-GRW	
SPRING15-T01N-GRW	
MMW-19A-T01N-GRW	
SPRING9-T01N-GRW	
SPRING10-T01N-GRW	
RB04T-GRW	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WATRAS1 Sampling Event: SFW Re-analyses

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 09/10/03

Peer Reviewer: Stacey Coker Date Completed: 09/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[(2)]	Matrix	Analysis: Metals
RR-14-D01N-SFW	SA	537486		W	X
RR-12-D01N-SFW	SA	537487		W	X
RR-13-D01N-SFW	SA	537488		W	X
RR-13-D01D-SFW	FD	537489		W	X
RR-16-D01N-SFW	SA	537490		W	X
RR-11C-D01N-SFW	SA	537491		W	X
RR-10A1-D01N-SFW	SA	537492		W	X
RR-11A1-D01N-SFW	SA	537493		W	X
RR-7-D01N-SFW	SA	537494		W	X
RR-10-D01N-SFW	SA	537495		W	X
RR-DS-SPRING13-D01N-SFW	SA	537496	RR-DSSPRG13-D01N-SFW-020203	W	X
RR-DS-SPRING13-D01D-SFW	FD	537497	RR-DSSPRG13-D01D-SFW	W	X
RR-DS-SPRING39-D01N-SFW	SA	537498	RR-DSSPRG39-D01N-SFW	W	X
RR-US-SPRING13-D01N-SFW	SA	537499	RR-USSPRG13-D01N-SFW	W	X
RR-US-SPRING39A-D01N-SFW	SA	537500	RR-USSPRG39A-D01N-SFW	W	X
RR-US-SPRING39-D01N-SFW	SA	537501	RR-USSPRG39-D01N-SFW	W	X
RR-DS-SPRING13-D01N-SFW	SA	537502	RR-DSSPRG13-D01N-SFW-020903	W	X
RR-DS-SPRING13-D01N-SFW	SA	537503	RRDSSPG13-D01N-SFW	W	X
RR-US-SPRING13-D01N-SFW	SA	537504	RRUSSPRING13-D01N-SFW	W	X
RR-DS-SPRING39-D01D-SFW	FD	537505	RRDSSPRING-D01D-SFW	W	X

Matrix: W = Water
QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The analytical results presented in the enclosed submittal represent re-analyses performed for surface water samples collected in January, February and March. These samples were re-analyzed for dissolved Aluminum, dissolved Arsenic and dissolved Cadmium with no dilutions to achieve the lowest possible reporting limit.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	N/A	
Holding Times	No	The 180-day holding time for metals was exceeded by numerous days for the majority of samples. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blank Results	No	Aluminum was detected in the initial calibration and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	NA	This package did not include any matrix spike, post-digestion spike or laboratory duplicates. The matrix QC analyses for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Method QC • Surrogates • Serial Dilution RR-14-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	None of the three metals for the serial dilution analysis on sample RR-14-D01N-GRW were applicable, as all initial sample results were not sufficiently larger (x50) than the IDL (adjusted for dilution).
Field QC • Field Duplicates RR-13-D01D-SFW RR-DS-SPRING13-D01D-SFW RR-DS-SPRING39-D01D-SFW • Rinsate Blank • Field Blank • Trip Blank	Yes	The results for all field duplicate pairs satisfied the concentration-dependent evaluation criteria outlined in SOP 12.1. The parent sample for RR-DS-SPRING39-D01D-SFW was not included in the data package, however, it is included in the WATRAS2 package. The field duplicate pairs between the two data packages satisfy the concentration-dependent evaluation criteria outlined in SOP 12.1. This package did not include any rinsate, field or trip blanks. The field duplicate results for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Nondetect Results w/ Elevated RLs?	N/A	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Results Outside Evaluation Criteria and Resultant Data Qualification

Sample	# of Days in Excess of Holding Time	Metals			Qualification
		Aluminum	Arsenic	Cadmium	
RR-14-D01N-SFW	207	73.6 J	0.20 U	0.84 J	UJ HT-I Or J HT-I
RR-12-D01N-SFW	208	112 J	0.20 U	0.59 J	
RR-13-D01N-SFW	208	126 J	0.20 U	0.56 J	
RR-13-D01D-SFW	208	134 J	0.20 U	0.52 J	
RR-16-D01N-SFW	207	73.2 J	0.20 U	0.77 J	
RR-11C-D01N-SFW	208	158 J	0.20 U	0.62 J	
RR-10A1-D01N-SFW	208	83.2 J	0.20 U	0.33 J	
RR-11A1-D01N-SFW	208	68.5 J	0.20 U	0.25 J	
RR-7-D01N-SFW	209	116 J	0.20 U	0.42 J	
RR-10-D01N-SFW	209	110 J	0.20 U	0.34 J	
RR-DS-SPRING13-D01N-SFW	193	279 J	0.20 U	0.84 J	
RR-DS-SPRING13-D01D-SFW	193	232 J	0.20 U	0.91 J	
RR-DS-SPRING39-D01N-SFW	193	110 J	0.20 U	0.60 J	
RR-US-SPRING13-D01N-SFW	193	128 J	0.20 U	0.66 J	
RR-US-SPRING39A-D01N-SFW	193	90.9 J	0.20 U	0.46 J	
RR-US-SPRING39-D01N-SFW	193	78.4 J	0.20 U	0.53 J	
RR-DS-SPRING13-D01N-SFW	186	119 J	0.20 U	0.75 J	

Table 1.2
Blank Detection Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	ICB (µg/l)	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	21.7	23.9	32.4	34.8	37.5	18.3	RR-14-D01N-SFW RR-12-D01N-SFW RR-13-D01N-SFW RR-13-D01D-SFW RR-16-D01N-SFW RR-11C-D01N-SFW RR-10A1-D01N-SFW	U CCB-I

Analyte	ICB (µg/l)	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	IDL	Samples Qualified	Qualification Code
							RR-11A1-D01N-SFW RR-7-D01N-SFW RR-10-D01N-SFW RR-DS-SPRING39-D01N-SFW RR-US-SPRING13-D01N-SFW RR-US-SPRING39A-D01N-SFW RR-US-SPRING39-D01N-SFW RR-DS-SPRING13-D01N-SFW RR-DS-SPRING13-D01N-SFW RR-US-SPRING13-D01N-SFW RR-DS-SPRING39-D01D-SFW	

MB=Method Blank P=ICP ICB – Initial Calibration Blank CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table is limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE FEBRUARY 2003 SAMPLING EVENT

Prepared for

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Questa, New Mexico

December 2003

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140849

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Summary of Reanalyses Due to Matrix Related Analyses Issues 2-1

Section 3 Data Review Process 3-1

Section 4 Data Review Commentary 4-1

4.1 Data Review Narratives 4-1
4.2 General Data Quality Issues 4-1
4.2.1 Holding Blanks 4-1
4.2.2 Manual Integration 4-1
4.2.3 Low-Level Detections 4-1
4.2.4 TICS Reported In Blanks 4-1
4.2.5 Dilution Schemes/Non-Detects With Elevated RLs 4-2
4.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses: 4-2
4.2.7 Non-Valid Matrix Spikes 4-2
4.2.8 Laboratory Performance Review (LPR) Findings 4-2

Section 5 Collective Summary/Assessment of Matrix QC Results 5-1

5.1 Matrix Spike Results (Accuracy Evaluation) 5-1
5.1.1 Groundwater Matrix Spike 5-2
5.1.2 Surface Water Matrix Spike 5-3
5.2 Spike Duplicate Results and Laboratory Duplicates (Precision Evaluation) 5-3
5.2.1 Organic Analyses (MS/MSD Relative Percent Difference (RPD)) 5-3
5.2.2 Metals and Inorganic Laboratory Duplicates 5-4
5.3 Serial Dilution Results 5-4
5.3.1 Groundwater Serial Dilutions 5-4
5.3.2 Surface Water Serial Dilutions 5-4

Section 6 Collective Summary/Assessment of Field QC Results 6-1

6.1 Field Duplicate Samples 6-1
6.1.1 Groundwater Field Duplicate Results 6-2
6.1.2 Surface Water Field Duplicates Results 6-3
6.2 Rinsate Blank Results 6-3
6.2.1 Groundwater Rinsate Blanks 6-3
6.2.2 Surface Water Rinsate Blanks 6-4
6.3 Field Blank Results 6-5

TABLE OF CONTENTS

Section 7 Overall Data Quality Indicator Assessment 7-1

7.1 Precision 7-1
7.2 Accuracy 7-1
7.3 Completeness 7-1
7.4 Representativeness 7-2
7.5 Comparability 7-2
7.6 Sensitivity 7-2

Tables

Table 1-1 Summary of Groundwater Samples Collected During February, 2003

Table 1-2 Field Identification of Surface Water Samples Collected During February, 2003

Table 2-1 Re-analyses Summary for Water Samples Collected During February, 2003

Table 5-1 Field Samples Submitted for Matrix Spike / Matrix Spike Duplicates

Table 5-2 Count of Matrix Spike Samples Collected in February, 2003

Table 5-3 Matrix Spike / Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Table 5-4 Matrix Spike / Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Table 6-1 Water Samples Submitted For Field Duplicate Analyses

Table 6-2 Field Duplicate Collection Frequency for the February, 2003 Sampling Event

Table 6-3 Groundwater Field Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Table 6-4 Rinsate Blanks Collected During the February 2003, Sampling Event

Table 6-5 Groundwater Rinsate Blank Outliers and Corresponding Results Qualification for Samples Collected During February 2003

Table 6-6 Surface Water Rinsate Outliers and Corresponding Results Qualification for Groundwater Samples

Attachments

Attachment 1.1 Data Package WAT046

Attachment 1.2 Data Package WAT047

Attachment 1.3 Data Package WAT048

Attachment 1.4 Data Package WAT049

Attachment 1.5 Data Package WAT050

Attachment 1.6 Data Package WAT051

TABLE OF CONTENTS

Attachment 1.7 Data Package WATRAF2

Attachment 1.8 Data Package WATRAS1

This data validation report is intended to provide the reader with a general overview of the usability of chemical data obtained from the February 2003 sampling activities at Molycorp. In addition, this data validation report is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

This report contains the results of the data validation conducted for groundwater samples collected in February of 2003 at the Molycorp Questa Mine, Questa, New Mexico. These water samples were collected in support of the Remedial Investigation/Feasibility Study (RI/FS). The water samples were sent to Severn Trent Laboratories (STL) Burlington in Colchester, VT. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods used and quality control samples collected were in accordance with the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). The results were reported in 6 original and 2 re-analyses data packages.

The groundwater and surface water samples collected during the February 2003 sampling event and their associated chemical analyses are summarized in Tables 1-1 and 1-2, respectively. Included in these tables is the frequency of QC sample s collected for each matrix.

Table 1-1
Summary of Groundwater Samples Collected During February, 2003

Sample Identification	Dissolved Metals	Total Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
MW-1-T01N-GRW	X, FD	X, FD	X, FD			
MW-20-T01N-GRW	X	X	X			
MW-24-T01N-GRW	X, MS, LD	X, MS, LD	X, MS, LD			
MW-9A-T01N-GRW	X, RB	X, RB	X, RB			
MW-17-T01N-GRW	X	X	X	X	X	
MMW-17A-T01N-GRW	X	X	X			
MMW-17B-T01N-GRW	X	X	X			
MMW-42B-T01N-GRW	X	X	X			
MMW-44B-T01N-GRW	X, RB	X, RB	X, RB	X, RB	X, RB	X, RB
MMW-28A-T01N-GRW	X	X	X	X	X	X
MMW-47A-T01N-GRW	X, MS, LD	X, MS, LD	X, MS, LD	X, MS/MSD	X, MS/MSD	X, MS/MSD
MMW-31B-T01N-GRW	X	X	X			X
MMW-29A-T01N-GRW	X	X	X			X
MMW-45B-T01N-GRW	X	X	X			
MMW-45A-T01N-GRW	X	X	X			
MMW-48A-T01N-GRW	X	X	X	X, FB	X, FB	X, FB
MMW-44A-T01N-GRW	X, FD	X, FD	X, FD	X, FD	X, FD	X, FD
GWW-1-T01N-GRW	X	X	X			X
GWW-2-T01N-GRW	X	X	X			X
GWW-3-T01N-GRW	X	X	X			X
MMW-49A-T01N-GRW (02/02)	X	X	X			
MMW-49A-T01N-GRW (02/08)	X	X	X			X
MMW-10A-T01N-GRW	X	X	X			X
MMW-33A-T01N-GRW	X	X	X			
SPRING39PUMP-T01N-GRW	X	X	X			X
SRPING13PUMP-T01N-GRW	X	X	X			X

Sample Identification	Dissolved Metals	Total Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
Number GRW samples	26	26	26	6	6	14
Number MS/MSD or MS/LD	2	2	2	1	1	1
Number Field Duplicates	2	2	2	1	1	1
Number Rinsate Blanks	2	2	2	1	1	1
Number Field Blanks	NA	NA	NA	1	1	1

NS = Not Sampled MS/MSD = Matrix Spike/Matrix Spike Duplicate NA= Not Applicable
RB = Rinsate Blank FD = Field Duplicate FB = Field Blank GRW- Groundwater
MS = Matrix Spike LD = Laboratory Duplicate

Notes:

1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".
2. Shaded cells denote new locations sampled for the first time in February 2003.

Table 1-2
Field Identification of Surface Water Samples Collected During February, 2003

Analyses	Total Metals	Dissolved Metals	Inorganics
RR-DSSPRING13-T01N-SFW (02/02)	X, RB, FD	X, FD	X, RB, FD
RR-DSSPRING39-T01N-SFW (02/02)	X, MS, LD	X, MS, LD	X, MS
RR-USSPRING13-T01N-SFW (02/02)	X	X	X
RR-USSPRING39-T01N-SFW (02/02)	X	X	X
RR-DSSPRING13-T01N-SFW (02/09)	X	X	X
RR-DSSPRING39-T01N-SFW (02/09)	X	X	X
RR-USSPRING13-T01N-SFW (02/09)	X	X	X
RR-USSPRING39-T01N-SFW (02/09)	X	X	X
Number SFW samples	8	8	8
Number MS/MSD or MS/LD	1	1	1
Number Field Duplicates	1	1	1
Number Rinsate Blanks	1	1	1
Number Field Blanks	NA	NA	NA

NS = Not Sampled DS = Downstream US = Upstream
FB = Field Blank MS = Matrix Spike LD = Laboratory Duplicate
RB = Rinsate Blank FD = Field Duplicate SFW= Surface water

Notes:

1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".
2. Shaded cells denote new locations. Samples were collected twice in February 2003 in order to obtain data for before and after start-up of the seepage interceptor collection system.

The QAPP required that the quality control samples listed above be collected at a frequency of 5%. As illustrated by the tables above, the required frequency of QC analyses was satisfied for each analysis type.

SECTIONTWO Summary of Reanalyses Due to Matrix Related Analyses Issues

During review of the October and December 2002 groundwater and surface water data sets, it became apparent that there were matrix-related analysis problems. The serial dilution results, comparisons with historical results, and charge balances suggested that matrix-related issues existed for the fluoride analysis. The laboratory conducted several studies in order to determine analysis solutions to the matrix related analysis problems. Each analysis problem, investigation, and solution is described in detail in the Data Validation Report for the Fall 2002 Groundwater and Surface water samples. As a result of this matrix related analysis problem and subsequent studies, various samples required reanalysis, as summarized below.

- All February 2003 samples for which the aluminum concentrations were greater than 3 mg/L were reanalyzed for fluoride. For the reanalyses, samples were diluted based on the aluminum concentration prior to addition of the chelating buffer.
- The filtered surface water samples were reanalyzed for dissolved aluminum, arsenic and cadmium without dilution in order to attain the lowest reporting limits possible. The results for the reanalyses were selected for reporting and the data sheets were annotated accordingly.

A summary of the February 2003 samples which were reanalyzed is provided in the following table. The table includes a listing of the data package in which the original results were reported and the data package in which the reanalysis results are reported.

Table 2-1
Re-analyses Summary for Water Samples Collected During February, 2003
Molycorp Site

Site ID	Dissolved Al, Al and Cd	Fluoride	Original SDG	Reanalysis SDG
GWW-1-T01N-GRW		X	WAT050	WATRAF2
GWW-2-T01N-GRW		X	WAT050	WATRAF2
GWW-3-T01N-GRW		X	WAT050	WATRAF2
MMW-45A-T01N-GRW		X	WAT049	WATRAF2
MMW-45B-T01N-GRW		X	WAT049	WATRAF2
MMW-49A-T01N-GRW (02/02)		X	WAT047	WATRAF2
MMW-49A-T01N-GRW (02/08)		X	WAT050	WATRAF2
SPRING13PUMP-T01N-GRW		X	WAT051	WATRAF2
SPRING39PUMP-T01N-GRW		X	WAT050	WATRAF2
RR-DSSPRING13-D01N-SFW	X		WAT046	WATRAS1
RR-DSSPRING13-D01D-SFW	X		WAT046	WATRAS1
RR-DSSPRING39-D01N-SFW	X		WAT046	WATRAS1
RR-USSPRING13-DO1N-SFW	X		WAT047	WATRAS1
RR-USSPRING39A-D01N-SFW	X		WAT047	WATRAS1
RR-USSPRING39-D01N-SFW	X		WAT047	WATRAS1
RR-DSSPRING13-DO1N-SFW	X		WAT051	WATRAS1

As noted in Section 4, the results for the reanalyses were reviewed in the same fashion as the original analyses. As a result of this review, the results obtained for reanalyses were selected for reporting and the original results were discarded.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, Inductively Coupled Plasma Spectroscopy (ICP) serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1, and is as follows: If no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used. If no criteria are specified in the SOP or the QAPP then the method-specified acceptance limits were used. If no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

Whenever professional judgment was exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative. As outlined in Section 2, some samples were reanalyzed for fluoride due to matrix conditions unique to the Molycorp Site. The reanalysis packages received the same review as the original packages. In all cases, the reanalysis results supercede those that were initially reported. Section 4 and Attachment 1 provide the data review narratives for each of the data packages, including the reanalysis packages.

After completing the review sample-specific and laboratory performance parameters in accordance with SOP 12.1, the site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. The reason for this is that site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC

measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 5.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Where applicable, the potential direction of bias (high, low, or indeterminate) has been indicated on the tables in the text, and noted on the sample results sheets as H, L, or I, respectively. Section 6.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 7.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

4.1 DATA REVIEW NARRATIVES

The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries, which are included in Attachment 1. The data qualifiers, reason codes, and bias codes have been marked on the data sheets, which are retained in the project files. The data validation qualifiers reason codes and bias codes are also stored in the electronic database.

4.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identified whether findings globally affect all relevant water samples analyzed for the February 2003 Groundwater and Surface Water Sampling Event. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

4.2.1 Holding Blanks

For the analysis of the volatile organic samples, a holding blank was carried through the sample storage period and analyzed in the same sequence as the samples in the data package. As all holding blank recoveries were all nondetect, the indication of the occurrence of potential cross-contamination during sample storage was unlikely.

4.2.2 Manual Integration

Manual integration was employed in deriving results for the volatile and semivolatile organics in a few data packages. The values that were derived from manual integration were qualified on the quantitation reports and extracted ion current profiles were included for each instance. The supporting documentation provided was reviewed and found to be adequate.

4.2.3 Low-level Detections

Detected organic analytes with concentrations between the Method Detection Limit (MDL) and the Reporting Limit (RL) were qualified as estimated (J). A qualifier code of “SQL-I” (Sample Quantitation Limit) was assigned to reflect the greater uncertainty in quantitative values below the RL.

4.2.4 TICS Reported in Blanks

Several Tentatively Identified Compounds (TICs) were reported as present in the semivolatile blanks for each package. The unknown compounds detected in the method blank were qualified as (NJ) to denote the analyses indicated the presence of an analyte that had been “tentatively identified” and the associated numerical value represented its approximate value. However, if similar TICs were present in the associated samples, the results were not considered to be

reportable due to laboratory contamination (as indicated by the blank) and therefore, flagged as unusable (R). After evaluating sample TICs based on laboratory method blanks, any remaining TICs were qualified as "NJ."

4.2.5 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

4.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses:

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

4.2.7 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

4.2.8 Laboratory Performance Review (LPR) Findings

As mentioned previously, one data package, WAT050, was given a full validation to assess the performance of the laboratory for all analyses. If data qualification was required due to a

specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated for all packages for this event included:

- Initial calibration results for VOCs and SVOCs
- Continuing calibration results for VOCs and SVOCs
- LCS results for PYX

In general, qualification was limited to the parent sample if fewer than a quarter of the applicable matrix spike recoveries were outside the acceptance range. Conversely, if more than a quarter of the applicable matrix spike recoveries were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average matrix spike recovery, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

The site-specific Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, method duplicate (MD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three sections present a discussion on the MS/MSD analyses, MD analyses, and the serial dilution results for the groundwater and surface water samples collected during the February, 2003 sampling event.

5.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Additional aliquots of two groundwater and one surface water sample were submitted for use in matrix QC analyses. Table 5-1 below summarizes the site-samples that were used to prepare matrix spike and matrix spike duplicate samples.

Table 5-1
Field Samples Submitted for Matrix Spike/Matrix Spike Duplicates

Sample ID	Matrix	Data Package	Analysis					
			Total Metals	Dissolved Metals	Wet Chemistry	Volatile Organics	Semivolatile Organics	Explosives
MW-24-T01N-GRW	Groundwater	WAT047	x	x	x			
MW-47A-T01N-GRW	Groundwater	WAT049	x	x	x	x	x	x
RR-DSSPRING39-SFW (02/02)	Surface water	WAT046	x	x	x			

Notes:

1. For Metals and Inorganic Analyses, a single matrix spike sample was analyzed.
2. For Organic Analyses, duplicate matrix spike samples were analyzed.
3. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

The following table lists the groundwater and surface water MS/MD sample sets relative to the number of field samples.

Table 5-2
Count of Matrix Spike Samples Collected in February, 2003

Analyses	Number of MS Samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	2	26	8
Dissolved Metals	2	26	8
Wet Chemistry	2	26	8
VOC	1	6	17
SVOC	1	6	17
Explosives	1	14	7
Surface Water			
Total Metals	1	8	13
Dissolved Metals	1	8	13
Wet Chemistry	1	8	13
VOC	NA	NA	NA

Analyses	Number of MS Samples	Total Samples	Percentage (%)
SVOC	NA	NA	NA
Explosives	NA	NA	NA

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

5.1.1 Groundwater Matrix Spike

Although the majority of the groundwater matrix spike recoveries were within acceptance limits, some were not. Table 5-3 summarizes the spike recoveries that were outside acceptance limits and the subsequent result qualification applied to the associated samples.

Table 5-3
Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte (Control Limits %)	Sample ID	MS or MS and MSD Recovery	Frequency of Limit Exceedance*	Action
Metals				
Cyanide (75-125)	MMW-47A-T01N-GRW	67.8	1 of 2	J/UJ MS-L for all sample results.
Wet Chemistry				
Sulfate (75-125)	MW-24-T01N-GRW	58.0	1 of 2	J/UJ MS-L for all sample results.
Bicarbonate Alkalinity (75-125)	MW-24-T01N-GRW	0.0	NA	None[1]
VOC All results were within criteria				
SVOC All results were within criteria				
Explosives				
PYX (70-130)	MMW-47A-T01N-GRW	7 and 20	1 of 1	J/UJ MS-L for all sample results.

[1] Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the accepted range of 75-125% in the sample specific reviews. However, using professional judgement, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses are not a pertinent measure of accuracy. The highly variable pH range of the water and the associated carbonate species equilibria was found to affect the matrix spike recoveries more than the expected accuracy of the analysis. The matrix spiked samples were found to have significantly different pHs than the parent samples, due to the presence of carbonate confounded by a dilution effect.

Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy of the analysis.

For each of the analytes listed in the table above, it was considered necessary to extend qualification to the balance of the February 2003 groundwater samples because more than a quarter of the spike results were outside evaluation criteria.

Although results for some analytes were qualified based on matrix spike recoveries, none warranted rejection. Additionally, the vast majority (>97%) of matrix spike results were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

5.1.2 Surface Water Matrix Spike

Although the majority of the surface water matrix spike recoveries were within acceptance limits, some were not. Table 5-4 summarizes the spike recoveries that were outside acceptance limits and the subsequent result qualification applied to the associated samples.

Table 5-4
Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Analyte (Control Limits %)	Sample ID	MS or MS and MSD Recovery	Frequency of Limit Exceedance	Action
Total and Dissolved Metals All results were within criteria				
Wet Chemistry				
Fluoride	RR-DSSPRING-39-T01N-SFW (02/02)	69.7	1 of 2	J/UJ MS-L for all sample results.
COD	RR-DSSPRING-39-T01N-SFW(02/02)	69.2	1 of 2	J/UJ MS-L for all sample results.
VOC All results were within criteria				
SVOC All results were within criteria				
Explosives All results were within criteria				

For each of the analytes listed in the table above, it was considered necessary to extend qualification to the balance of the February 2003 groundwater samples because more than a quarter of the spike results were outside evaluation criteria.

Although results for some analytes were qualified based on matrix spike recoveries, none warranted rejection. Additionally, the vast majority (>97%) of matrix spike results were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

5.2 SPIKE DUPLICATE RESULTS AND LABORATORY DUPLICATES (PRECISION EVALUATION)

The following subsections to the precision of analytical results based on their reproducibility. Section 5.2.1 discusses the organic analyses for which precision was evaluated by analysis of duplicate spiked samples. Section 5.2.2 discusses the metals and inorganic analyses for which precision was evaluated by the analysis of laboratory duplicates.

5.2.1 Organic Analyses (MS/MSD Relative Percent Difference (RPD))

The relative percent differences between MS and MSD results for target analytes contained in the spiking solutions used by the laboratory were within QAPP acceptance limits. No ground water or surface water results were qualified based on the RPD between the MS and the MSD results. As such, the precision of the organic analyses relative to the site-specific matrix is considered to be acceptable.

5.2.2 Metals and Inorganic Laboratory Duplicates

The laboratory duplicate sample analysis results are used to evaluate the precision of the laboratory analyses. The evaluation criteria used are dependent on the concentration of the analyte in the sample. Acceptable precision is demonstrated by an RPD<20% when both results are more that five times the reporting limit (RL). When either sample concentration is <5xRL, acceptable precision is demonstrated by an absolute difference between results of < 1xRL. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was used as the RL for these concentration dependent evaluations because the laboratory reported used the IDLs as the quantitative RLs. The IDLs are considered to be too low for such comparisons to be meaningful. Additionally, using the CLP CRDL is consistent with The National Functional Guidelines, which were used as guidance for data review in addition to SOP 12.1.

All laboratory duplicate results satisfied the applicable evaluation criterion. Therefore, no qualifications of data were necessary on the basis of laboratory duplicate results. As such, the laboratory duplicate results are considered to indicated that acceptable levels of overall precision (sampling and analytical) were attained on the site-specific matrix.

5.3 SERIAL DILUTION RESULTS

ICP serial dilutions are analyzed to help evaluate whether or not interferences exist due to sample matrix. When analyte concentrations are sufficiently high (defined as minimally 50x greater than the instrument detection limit [IDL]), results for a straight and five fold dilution are expected to agree within 10%. Otherwise interferences resulting in signal suppression or enhancement might be suspected.

In general, qualification was limited to the parent sample if fewer than a quarter of the applicable serial dilution results were outside the acceptance range. Conversely, if more than a quarter of the applicable serial dilution results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average %D, the magnitude of the exceedances, and the number of valid results relative to the size of the sample set.

5.3.1 Groundwater Serial Dilutions

Five groundwater samples were used for serial dilution tests. The percent differences (%Ds) between the original sample results and the result obtained from a five-fold diluted sample were all <10% for analytes with applicable sample concentrations. Therefore, no qualifications of data were necessary.

5.3.2 Surface Water Serial Dilutions

Two surface water samples were analyzed for serial dilution. The percent differences (%Ds) between the original sample results and the result obtained from a five-fold diluted sample were all <10% for analytes with applicable sample concentrations. Therefore, no qualifications of data were necessary.

The site-specific field duplicate samples, rinsate blanks and field blanks were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrices. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

6.1 FIELD DUPLICATE SAMPLES

The field duplicate sample analysis results may be used to evaluate the overall precision of the analyses (analytical and sampling precision) and/or the sample representativeness. The following concentration dependent evaluation was used. Where both results were greater than or 5 times the Reporting Limit (RL), the Relative Percent Difference (RPD) between the results was compared to a criterion of ≤25%. If either result was less than 5 times the RL, the absolute difference was compared to a criteria of ≤ 2xRL. Similar to the laboratory duplicate evaluations, the CRDL was used as the RL for these comparisons.

In general, qualification was limited to the parent sample if fewer than a quarter of the field duplicate results were outside the acceptance range. Conversely, if more than a quarter of the field duplicate results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the magnitude of the exceedances (marginal vs. gross) and the complexity of the sample matrix.

Field duplicate samples were collected during this sampling event for metals, wet chemistry, Volatile Organic Compounds (VOCs), Semivolatile Organic Compounds (SVOCs), and explosives. Tables 6-1 and 6-2 below summarize the field duplicate samples collected and the frequency of field duplicate collection per analysis type, respectively.

Table 6-1
Water Samples Submitted for Field Duplicate Analyses

Sample ID	Matrix	Data Package	Analysis					
			Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
RR-DSSPRING-13-T01N-SFW (02/02) RR-DSSPRING-13-T01D-SFW (02/02)	Surface Water	WAT046	x	x	x			
MW-1-T01N-GRW/ MW-1-T01D-GRW	Groundwater	WAT047	x	x	x			
MMW-44A-T01N-GRW/ MMW-44A-T01D-GRW	Groundwater	WAT049	x	x	x	x	x	x

1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

Table 6-2
Field Duplicate Collection Frequency for the February, 2003 Sampling Event

Analyses	Number of FD Samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	2	26	8

Analyses	Number of FD Samples	Total Samples	Percentage (%)
Dissolved Metals	2	26	8
Inorganics	2	26	8
VOC	1	6	17
SVOC	1	6	17
Explosives	1	14	7
Surface Water			
Total Metals	1	8	13
Dissolved Metals	1	8	13
Inorganics	1	8	13
VOC	0	0	0
SVOC	0	0	0
Explosives	0	0	0

As shown on the above table, the 5% (or 1 in 20) frequency specification for field duplicates was met for the groundwater and surface water samples.

6.1.1 Groundwater Field Duplicate Results

The groundwater field duplicate sample results not meeting acceptance criteria and resultant data qualification issued is summarized in Table 6-3 below.

Table 6-3
Groundwater Field Duplicate Outliers and Corresponding Results
Qualification for Groundwater Samples

Sample ID	Analyte	RPD or Difference	Comment	Action
Metals				
MW-1-T01N-GRW MW-1-T01D-GRW	Total Manganese	RPD=30.8%	1 out of 2	J/UJ FD-I for all samples
Wet Chemistry All results were within criteria				
VOC All results were within criteria				
SVOC All results were within criteria				
Explosives All results were within criteria				

Data qualification for manganese was extended to all samples because greater than a quarter of the field duplicate results were outside the applicable evaluation criterion. The results were qualified as estimated with an indeterminate bias direction.

Although some results were qualified based on field duplicate agreement, the vast majority (>99%) of the field duplicate results were within limits.

6.1.2 Surface Water Field Duplicates Results

All field duplicate results were within evaluation criteria for surface water samples, therefore, no qualifications of data were necessary.

6.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Tables 6-4 and 6-5 lists the rinsate blanks that were collected during the February 2003 sampling event and the parameters for which they were analyzed.

Table 6-4
Rinsate Blanks Collected During the February, 2003 Sampling Event

Sample ID (Date)*	Matrix	Data Package	Analysis						
			Total Metals	Dissolved Metals	Inorganics	Hardness	Volatile Organics	Semivolatile Organics	Explosives
RB01T-GRW (02/07)	Groundwater	WAT048	x	x	x	x	x	x	x
RB02T-GRW (02/07)	Groundwater	WAT048	x	x	x	x			
RB01T-SFW (02/04)	Surface water	WAT047	x	x	x				

* The "T" in the field ID was changed to "D" for dissolved metals samples.

The QAPP required frequency of 5% for the collection of rinsate blanks was met for the February, 2003 water sampling event.

The rinsate blank detections results and the resulting data qualification issued is summarized in Tables 6-2 and 6-3. To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result which might bias the average low or biasing the average high by using the reporting limit.

6.2.1 Groundwater Rinsate Blanks

The table below summarizes the groundwater rinsate blank results and the resultant data qualification issued.

Table 6-5
Groundwater Rinsate Blank Outliers and Corresponding Results Qualification for Samples Collected during February, 2003

Analyte	Sample ID*	Conc.	Ave Conc.	RL	Frequency of Detection	Range for Field Samples	Action
Metals (ug/l) All rinsate blank results were non-detect							
Dissolved Metals (ug/l) All rinsate blank results were non-detect							
Inorganic Parameters (mg/L)							
Chloride	RB02T-GRW (02/07)	0.55	0.375	0.4	1 of 2	2.7-88.6	None. Qualification was not necessary because all sample concentrations were >1.88 mg/L.
Total Alkalinity and Bicarbonate Alkalinity	RB01T-GRW (02/07)	2.7	2.8	1	2 of 2	1.5-411	All total alkalinity results <14.0 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW (02/07)	2.9		1			
Ammonia as N	RB01T-GRW (02/07)	0.067	0.058	0.04	2 of 2	0.05-0.16	All ammonia as N results <0.29 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW (02/07)	0.048		0.04			
Phosphorus	RB01T-GRW (02/07)	0.013	0.009	0.01	1 of 2	0.012-0.26	All phosphorus results <0.045 mg/L were qualified as nondetect (U RB-I).
VOC (µg/L)							
Acetone	RB01T-GRW (02/07)	2	2[1]	10	1 of 1	0.1-0.1	All acetone results <6.25 mg/L were qualified as nondetect (U RB-I).
SVOC (µg/L) All rinsate blank results were non-detect.							
Explosives All rinsate blank results were non-detect.							

ND= Nondetect MDL=Method Detection Limit RL= Reporting Limit

* The "T" in the field ID was changed to "D" for dissolved metals samples

[1] In calculating the average RB concentrations, a value of 1 was used for nondetect results, rather than the CRQL, as this value was considered more representative of the level down to which the laboratory reports positive results.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

6.2.2 Surface Water Rinsate Blanks

The surface water rinsate blank results and their effects regarding groundwater results qualification are provided in the following table:

Table 6-6
Surface Water Rinsate Blank Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte	Sample ID	Conc.	Ave. Conc.	RL	Frequency of Detection	Range for Field Samples	Action
Metals (ug/l)							
Molybdenum	RB01T-SFW	1.3	0.925	1.1	1 of 1	1.1-4.4	Total molybdenum results <4.625 ug/L qualified as nondetect (U RB-I)
Inorganic Parameters (mg/L)							
Bicarbonate Alkalinity and Total Alkalinity	RB01T-SFW	2.9	2.9	1	1 of 1	37.5-57.7	All sample concentrations were below the qualification levels.
TDS	RB01T-SFW	41	41	5	1 of 1	273-371	
TSS	RB01T-SFW	0.7	0.7	0.5	1 of 1	5.2-15.1	
Explosives All rinsate blank results were non-detect.							

ND= Nondetect MDL=Method Detection Limit RL= Reporting Limit

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

6.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field blanks are only required to be collected by the project QAPP when samples are analyzed for organics.

With one exception, all groundwater field blank results were non-detect for VOC, SVOC, and explosive compounds. Of the 60 total SVOC compounds analyzed for in the field blank sample FB01T-GRW (02/08), only one compound was detected, as summarized below.

Field Blank ID	Compound	Concentration ug/L	Range of Sample Concentration	Sample Result Qualification
FB01T-GRW	Bis (2-ethylhexyl)phthalate	4.0	All sample results were nondetect	None Necessary

Data qualification on the basis of field blank was not necessary because the single analyte detected was not detected in any February 2003 field samples.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory or rinsate blank contamination. In addition, some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summaries. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

7.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

Of 190 lab duplicate results, all satisfied the applicable evaluation criteria, for a total of 100%. Of 269 field duplicate results, 268 satisfied the applicable evaluation criteria, for a total of 99%. As such, the overall level of precision, both analytical and combined analytical and sampling demonstrated is considered to be acceptable.

7.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of Laboratory Control Samples (LCSs) and MSs.

Greater than 98% of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP. This indicates acceptable overall accuracy with respect to the analytical system. Four PYX recoveries were below evaluation criteria and results for associated samples were qualified during the sample specific review.

Ninety-seven percent of the MS recoveries (168 valid of 174 recoveries) satisfied the applicable evaluation criteria for accuracy specified in the QAPP, indicating that acceptable overall accuracy was attained with respect to the site matrix.

7.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements in relation to the number of measurements requested.

There were 34 samples (26 groundwater and 8 surface water) collected during the February 2003 sampling event. All samples yielded valid results for all target analytes, consequently the completeness achieved was 100%.

7.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting Field Sampling Plan FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the biota samples. The close agreement between the field duplicate results, as discussed above in Section 6.1, indicates that the samples collected were adequately representative of the medium sampled.

Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. Again, the close agreement between duplicates noted in Section 6.1 indicates that sample processing and subsampling procedures were acceptable.

7.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

7.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. As such, obtaining some nondetect results with elevated reporting limits was not avoidable. While it is anticipated that all data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT046 Sampling Event: February 2003

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 04/02/03

Peer Reviewer: Alan Roberts Date Completed: 04/08/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Metals	Inorganics	BOD	COD	PCBs
RR-DSSPRING-13 T01N-SFW	SA	516802	RR-DSSPRG13-T01N-SFW RR-DSSPRG13-T01N-SF	W	X	X	X	X	
RR-DSSPRING-13 D01N-SFW	SA	516803	RR-DSSPRG13-D01N-SFW R-DSSPRG13-D01N-SF	W	X				
RR-DSSPRING-13 T01D-SFW	FD	516804	RR-DSSPRG13-T01D-SFW RR-DSSPRG13-T01D-SF	W	X	X	X	X	
RR-DSSPRING-13 D01D-SFW	FD	516805	RR-DSSPRG13-D01D-SFW RR-DSSPRG13-D01D-SFW	W	X				
RR-DSSPRING-39-T01N-SFW	SA	516806	RR-DSSPRG39-T01N-SFW RR-DSSPRG39-T01N-SF	W	X	X			
RR-DSSPRING-39-D01N-SFW	SA	516807	RR-DSSPRG39-D01N-SFW RR-DSSPRS-D01N-SF RR-DSSPRG39D01NSFW	W	X				

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID. SPRING truncated to SPRG, hyphens removed.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

It is noted that the Total Organic Carbon (TOC) analysis by method 9060 was subcontracted to STL's Austin, Texas facility, due to a malfunction of the laboratory's TOC instrument, which could not be corrected within the analytical holding time. This does not affect the quality or usability of the data.

The laboratory case narrative noted the high level blank spike (LCS1) exhibited a percent recovery that exceeded control limits for TKN. Upon further inspection into the raw data sheets, it was determined that two laboratory control standards were run (LCS1 and LCS2). TKN was recovered in LCS1 at 131.8% and in LCS2 at 113.6%. The control limit for LCS percent recovery established by the laboratory is 80-120%, whereas the QAPP specifies 75-125%. All results for TKN were nondetect with the exception of sample RR-DSSRING-13-T01D-SFW. The TKN result for this sample was not qualified due to the fact that the matrix spike recovery for TKN was 95%, thereby demonstrating a low effect of site-specific sample matrix on the accuracy of the analysis.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

The metals analysis of the continuing calibration check standard, designated CCV5, yielded a 89.2% recovery for cadmium that was marginally below the established control limit of 90-110%. Due to the fact that the CCV5 was only associated with matrix spike sample RR-DSSPRING-39-D01N, as verified by the metals run log, no re-analysis was required, nor was data qualification necessary.

Selected surface water samples reported in this package were reanalyzed for dissolved aluminum, dissolved arsenic, and dissolved cadmium without dilution in order to achieve lower reporting limits to meet project objectives. The results for the re-analysis were reported in three data packages: WATRAS1, WATRAS2, and WATRAS3. Each package was reviewed in accordance with SOP 12.1. The results of the review are reported in separate data review narrative summaries. In all cases, the results for the re-analysis have been annotated to indicate which results were selected for reporting. The associated Data Validation Report for each sampling event affected contains further details.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	All nitrite, orthophosphate, BOD_5, and COD results for all relevant samples were qualified as estimated (J/UJ) with an indeterminate bias direction. The 48-hour holding times for nitrite, orthophosphate, and BOD_5 were exceeded by several hours to over 24 hours for BOD_5. The COD analyses of the samples in this delivery group were completed two days beyond the prescribed analytical holding time of 28 days. However, according to the internal chain of custody records, the analyses were performed within 48 hours of the generation of the DI water leachate, and were therefore qualified as estimated (J/UJ). Table 1.1 summarizes the holding time exceedances and the resultant data qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In all cases, the result was qualified as nondetect at the reported value.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS RR-DSSRING-39-T01NMS RR-DSSRING-39-D01NMS • LD RR-DSSRING-39-T01NREP RR-DSSRING-39-D01NREP	N/A	The matrix spike sample RR-DSSPRING-39-T01N (MS) recovered fluoride at 69.7% and COD at 69.2%, both below the lower limit of the acceptance range of 75-125%, thereby suggesting a potential low bias in the sample results. Accordingly, fluoride and COD analyte results were qualified as estimated (J/UJ) with a potential low bias for the parent sample. The matrix quality control results for the February 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) RR-DSSPRING-39-T01N-SFW RR-DSSPRING-39-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses on samples RR-DSSPRING-39-T01N-SFW and RR-DSSPRING-39-D01N-SFW were not applicable for all 24 metal analytes. It was therefore not necessary to qualify any results on the basis of serial dilutions. The orthophosphate concentration of 0.035 mg/L in sample RR-DSSPRING-13-T01D-SFW is greater than its phosphorus concentration of 0.35 mg/L. Due to the fact that both partial and total concentrations did not exceed 5x the RL (0.010), the absolute difference between the partial and total results were compared to an evaluation criterion of ±2x RL. Accordingly, the orthophosphate and phosphorus results for sample RR-DSSPRING-13-T01D-SFW were qualified as estimated (J/UJ) with an indeterminate direction of bias. The sodium concentration of 9170 µg/mL in the filtrate (dissolved) sample RR-DSSPRING-13-D01D is greater than the sodium concentration 6180 µg/mL in the corresponding total metals sample, RR-DSSPRING-13-T01D. Due to the fact that both values are greater than 5x the PQL, the evaluation criterion is to determine whether the samples agree within 30%. The sodium concentration for the dissolved sample is 48.4% greater than the sodium concentration for the total sample. Subsequently, the sodium results for both samples were qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion and subsequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No field QC samples accompanied this sample delivery group. The Field QC results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses a the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrite as N	Orthophosphate	BOD_5	COD
RR-DSSPRING-13 T01N-SFW	0.0050 UJ	0.010 UJ	1.5 UJ	20.0 UJ
RR-DSSPRING-13 T01D-SFW	0.0050 UJ	0.35 J	1.5 UJ	20.0 UJ
RR-DSSPRING39-T01N-SFW	0.0050 UJ	0.010 UJ	1.5 UJ	22.6 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	28.1	31.4	27.5	---	---	---	22.6	RR-DSSPRING-39-T01N-SFW	U CCB-I
Antimony (MS)	1.6	1.4	1.4	1.4	1.4	-1.599	0.30	RR-DSSPRING-13-D01D-SFW RR-DSSPRING-13-D01N-SFW RR-DSSPRING-13-T01D-SFW RR-DSSPRING-13-T01N-SFW RR-DSSPRING-39-D01N-SFW RR-DSSPRING-39-T01N-SFW	UJ MB-L
Boron (P)	8.2	4.3	3.6	3.7	7.0	---	2.7	RR-DSSPRING-13-D01D-SFW RR-DSSPRING-13-D01N-SFW RR-DSSPRING-13-T01D-SFW RR-DSSPRING-13-T01N-SFW RR-DSSPRING-39-D01N-SFW RR-DSSPRING-39-T01N-SFW	U CCB-I
Iron (P)	---	32.0	33.1	---	---	---	26.6	RR-DSSPRING-13-T01D-SFW RR-DSSPRING-13-T01N-SFW	U CCB-I
Molybdenum (P)	---	---	---	---	-2.0	---	1.1	RR-DSSRING-39-D01N-SFW	J CCB-L
Potassium (P)	---	---	---	-303.4	---	---	201.8	RR-DSSPRING-39-D01N-SFW	J CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

*****Data qualification was not necessary, as all of the aluminum, boron, copper, iron, potassium, and sodium results were sufficiently higher than 5x the blank concentrations.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT047 Sampling Event: January 2003

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 03/24/03

Peer Reviewer: Alan Roberts Date Completed: 04/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	BOD	COD	Explosives	VOCS	PCBs
RR-USSPRING13-T01N-SFW	SA	516809	RR-USSPRG13-T01N-SF	WA	X	X	X	X			
RR-USSPRING13-D01N-SFW	SA	516810	RR-USSPRG13-D01N-SF	WA	X						
RR-USSPRING39A-T01N-SFW	SA	516811	RR-USSPRG39A-T01N-SF	WA	X	X	X	X			
RR-USSPRING39A-DO1N-SFW	SA	516812	RR-USSPRG39A-D01N-SF	WA	X						
RR-USSPRING39-T01N-SFW	SA	516813	RR-USSPRG39-T01N-SF	WA	X	X	X	X			
RR-USSPRING39-D01N-SFW	SA	516814	RR-USSPRG39-D01N-SF	WA	X						
MMW-49A-T01N-GRW	SA	516815		WA	X	X					
MMW-49A-D01N-GRW	SA	516816		WA	X						
RB01T-SFW	RB	516817		WA	X	X	X	X			
MW-1-T01N-GRW	SA	516924		WA	X	X					
MW-1-D01N-GRW	SA	516925		WA	X						
MW-1-T01D-GRW	FD	516926		WA	X	X					
MW-1-D01D-GRW	FD	516927		WA	X						
MW-20-T01N-GRW	SA	516928		WA	X	X					
MW-20-D01N-GRW	SA	516929		WA	X						
MMW-31B-T01N-GRW	SA	516930		WA	X	X			X		
MMW-31B-D01N-GRW	SA	516931		WA	X						
MW-24-T01N-GRW	SA	516932		WA	X	X					
MW-24-D01N-GRW	SA	516933		WA	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

It is noted that the Total Organic Carbon (TOC) analysis by method 9060 was subcontracted to STL's Austin, Texas facility, due to a malfunction of the laboratory's TOC instrument, which could not be corrected within the analytical holding time. This does not affect the quality or usability of the data.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

The laboratory case narrative noted the nitroaromatic analysis of the blank spike sample with this delivery group yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded a percent recovery of 10%. This sample was re-extracted outside the prescribed holding time yielding a blank spike recovery for PYX that was below the default control criteria, but comparable to typical recoveries. The laboratory had not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recovery of 50% was below the lower limit but >10%, the PYX results for all samples have been qualified as estimated (J/UJ), with a low bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	According to a facsimile from Larry Brook (URS) to Don Dawicki (STL-Burlington), the following corrections are noted: On the COC for cooler 3, the sample collected on 02/02/03 at 14:35 (RR-USSPRING-39-T/D01N-SFW) should be renamed to RR-USSPRING-39A-T/D01N-SFW. The sample IDs for those volumes collected on 02/02/03 at 15:15 remain unchanged from how they are listed on the COC. Sample MMW-49A-T01N-GRW was marked for VOC analysis on the chain of custody. However, no volume was received for VOC analysis due to the fact that this was not a necessary analysis for this sample. This analysis request was disregarded and consequently was not run. At time of log-in, on 02/06/03, one cooler was not received which contained the QC volume for MW-24-T01N-GRW. This QC volume sample was received and logged in on 02/07/03. No qualification of data was necessary on the basis of chain of custody or sample receipt.

Review Parameter	Criteria Met?	Comments
Holding Times	No	The laboratory case narrative noted that several samples in this delivery group were received outside or at the end of the prescribed analytical holding time of 48 hours from the date of sample collection for the nitrite, orthophosphate, BOD, and nitrate analyses. Several nitrate, orthophosphate, and nitrite analyses were run several hours beyond the 48-hour holding time and were accordingly qualified as estimated (J/UJ). The BOD samples were run one day beyond the 48-hour hold time and were therefore qualified as estimated (UJ). The COD analyses of the samples in this delivery group were completed two days beyond the prescribed analytical hold-time of 28 days. However, according to the internal chain of custody, the samples were digested within 28 days and were therefore qualified as estimated (J/UJ). Several fluoride samples were analyzed one day beyond the prescribed analytical holding time of 28 days. Table 1.1 summarizes the holding time exceedances and the result data qualifications. The associated bias direction for these results qualified on the basis of holding times are indeterminate.
Method Blanks	No	Nitrogen in the form of ammonia was detected in the inorganic method blank laboratory sample BLKNH0228C run on 02/28/03 at 0.051 mg/L, which marginally exceeded the laboratory's reporting limit of 0.040 mg/L. The reported concentration was below the maximum reporting limit of 1.0 mg/L set forth in the project QAPP. The ammonia-nitrogen results for samples MMW-49A-T01N-GRW and RB10T-SOL, run on 02/28/03, were qualified as nondetect with an indeterminate direction of bias. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In all cases, the result was qualified as nondetect at the reported value.
Matrix QC • MS MW-24-T01N-GRWMS MW-24-D01N-GRWMS • MSD MW-24-T01N-REP MW-24-D01N-REP • LD MW-24-T01N-GRWD MW-24-D01N-GRWD	N/A	The laboratory case narrative noted the nitrate analysis of the matrix spike associated with sample MW-24-T01N-GRW was performed 13 days beyond the prescribed analytical holding time of 28 days due to a spiking error during the original analysis performed within the holding time. Recoveries were within acceptance limits in spite of exceedance of holding time, therefore no qualification was considered necessary. Sample MW-24-T01N-GRWMS failed to recover any bicarbonate alkalinity spike. The sulfate matrix spike for the same sample yielded a percent recovery of 58% that was outside the control limits of 75-125%. Accordingly, both bicarbonate alkalinity and sulfate results were qualified as estimated (J) with a low bias direction for the parent sample. The matrix spikes results were not appropriate for assessing accuracy for aluminum and iron, as a result or the sample concentration exceeding the spike amount by at least four times. Note: The matrix quality control results for the February 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Method QC • Surrogate • Serial Dilution MW-24-T01N-GRW (C) MW-24-D01N-GRW (C) • Total vs. Partial Analyses • Cation/Anion Balance	No	The water explosives surrogate recovery of S1 (1,2-Dinitrobenzene) for blank sample EBLKE9 (84%) was slightly below the lower end of the acceptable criteria recovery range of 85-116%. No qualification of data was necessary due to the fact that this was a blank sample. The ICP serial dilution analyses were conducted on samples MW-24-T01N-GRWL and MW-24-D01N-GRWL. The serial dilution conducted on MW-24-T01N-GRWL was not applicable to 23 out of the 24 metals. The manganese analyte, for which the dilution was applicable, exhibited a 2.3% deviation between the original sample and its 5-fold dilution. Likewise, the serial dilution conducted on MW-24-D01N-GRW was not applicable to 23 out of the 24 metals. The manganese analyte exhibited a 1.0% deviation between the original sample and its 5-fold dilution. Due to the fact that both percent deviations were ≤10%, no qualification of the data was necessary. The internal standard ^{89}Y recoveries were high for the ICPMS analysis of samples MMW-49A-T01N-GRW, MMW-49A-D01N-GRW, MMW-31B-T01N-GRW and MMW-31B-D01N-GRW. Therefore, molybdenum results for these samples, as verified by the run-logs, were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The internal standard ^{159}Tb recovery was high for the ICPMS analysis of sample MMW-49A-T01N-GRW. Therefore, barium and cadmium results for this sample, as verified by the run-logs, were reported from the trace ICP. The trace ICP barium and cadmium reporting limits met the requirements of the QAPP such that the change in instrumentation did not affect the usability of the data. Sample MMW-49A-T01N-GRW was diluted (DF=2) and reanalyzed by ICPMS. The analytical review report for ICPMS Metals in the raw data sheets verified the passing of the sample at the dilution factor of 2. No qualification of data was necessary on the basis of internal standards. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. The calculated anion/cation balance for sample MW-24-T/D01N-GRW was –14.78%. The bicarbonate meq/L contribution to the anion sum accounts for the imbalance. Since the bicarbonate analysis includes particulate bicarbonate, the value is not representative of dissolved bicarbonate. Therefore no qualification was considered necessary since the imbalance is attributable to bicarbonate. The laboratory case narrative noted the ratios of calculated versus measured TDS were also within the laboratory limits for all samples with the exception of MW-24. The TDS ratio for MW-24-T01N-GRW and MW-24-D01N-GRW was 1.38 which met the evaluation criterion of 0.5-1.5.
Field QC • Rinsate Blank RB01T-SFW (02/02/03) • Field Blank • Trip Blank	N/A	The Field QC results for the February 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Table 1.2 summarizes detections for RB01T-SFW.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Ortho-phosphate (mg/L)	Nitrite (mg/L)	BOD_5 (mg/L)	COD (mg/L)	Fluoride (mg/L)
RR-USSPRING13-T01N-SFW	---	0.010 UJ	0.005 UJ	1.5 UJ	20.0 UJ	0.85 J
RR-USSPRING39A-T01N-SFW	---	0.010 UJ	0.005 UJ	1.5 UJ	20.0 UJ	0.78 J
RR-USSPRING39-T01N-SFW	---	0.010 UJ	0.005 UJ	1.5 UJ	20.0 UJ	0.76 J
MMW-49A-T01N-GRW	---	---	0.005 UJ	---	---	20.6 J
RB01T-SFW	---	0.010 UJ	0.005 UJ	1.5 UJ	20.0 UJ	0.10 UJ
MMW-1-T01N-GRW	0.83 J	0.010 UJ	---	---	---	---
MW-1-T01D-GRW	0.83 J	0.010 UJ	---	---	---	---
MMW-31B-T01N-GRW	0.40 UJ	0.010 UJ	---	---	---	---
MW-24-T01N-GRW	1.0 J	0.010 UJ	---	---	---	---

Table 1.2
Metal Blanks

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS)	2.3	2.1	2.0	2.0	---	1.666	0.30	RB01T-SFW RR-USSPRING13-T01N-SFW	U MB, CCB-I
Boron (P5/4)	7.4/ 11.0	3.4/ 8.3	3.1/ 5.0	3.0/ 4.5	7.7/ 11.0	---/ 18.820	2.7	MMW-49A-D01N-GRW MMW-49A-T01N-GRW MW-20-D01N-GRW MW-24-D01N-GRW MW-24-T01N-GRW MW-20-T01N-GRW RR-USSPRING13-D01N-SFW RR-USSPRING13-T01N-SFW RR-USSPRING39A-D01N-SFW RR-USSPRING39A-T01N-SFW RR-USSPRING39-D01N-SFW RR-USSPRING39-T01N-SFW	U CCB-I U MB, CCB-I U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Copper (5/4)	---	2.1	---	---/ -2.0	1.8/ -2.3	---	1.7	MMW-31B-D01N-GRW MMW-1-D01D-GRW MW-1-T01D-GRW MW-1-D01N-GRW MW-20-D01N-GRW MW-20-T01N-GRW RB10T-SFW RR-USSPRING13-D01N-SFW RR-USSPRING39A-D01N-SFW RR-USSPRING39A-T01N-SFW RR-USSPRING39-D01N-SFW	U CCB-I
Molybdenum (P5/4)	1.4/ 1.2	---	---	---/ 1.4	2.1/ 1.9	1.124/ ---	1.1	MW-24-D01N-GRW RR-USSPRING13-D01N-SFW RR-USSPRING13-T01N-SFW RR-USSPRING39A-D01N-SFW RR-USSPRING39A-T01N-SFW RR-USSPRING39-D01N-SFW RR-USSPRING39-T01N-SFW	U CCB-I
Zinc (P)	---	---	---	---	---	8.010	3.9	MW-1-T01N-GRW MW-20-D01N-GRW MW-24-T01N-GRW MW-20-T01N-GRW RR-USSPRING13-D01N-SFW RR-USSPRING13-T01N-SFW RR-USSPRING39A-D01N-SFW RR-USSPRING39A-T01N-SFW RR-USSPRING39-D01N-SFW RR-USSPRING39-T01N-SFW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

*Data qualification was not necessary, as all of the aluminum, beryllium, cadmium, iron, potassium, and sodium results were sufficiently higher than 5x the blank concentrations or the results for that analyte were nondetect.

Table 1.2
Field Blank Detections

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB01T-SFW	02/02/03	Total Dissolved Solids (TDS)	41.0	5.0
		Total Suspended Solids (TSS)	0.70	0.50
		Bicarbonate Alkalinity	2.9	1.0
		Total Alkalinity	2.9	1.0
		Molybdenum	0.0013	0.0011

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT048 Sampling Event: January 2003

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter Date Completed: 03/20/03

Peer Reviewer: Alan Roberts Date Completed: 04/17/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
MMW-17-T01N-GRW	SA	516944	MW-17-T01N-GRW	WA	X	X	X	X			
MMW-17-D01N-GRW	SA	516945		WA	X						
MMW-17-T01N-GRW	SA	516946	MW-17-T01N-GRW	WA	X[3]						
TB137-GRW	TB	516947		WA			X				
MMW-42B-T01N-GRW	SA	517026		WA	X	X					
MMW-42B-D01N-GRW	SA	517027		WA	X						
MMW-44B-T01N-GRW	SA	517028	MMW44BT01N	WA	X	X	X	X	X		
MMW-44B-D01N-GRW	SA	517029		WA	X						
MMW-9A-T01N-GRW	SA	517030		WA	X	X					
MMW-9A-D01N-GRW	SA	517031		WA	X						
RB02T-GRW	RB	517032		WA	X	X					
RB02D-GRW	RB	517033		WA	X						
RB01T-GRW	RB	517034		WA	X	X	X	X	X		
RB01D-GRW	RB	517035		WA	X						
TB150-GRW	TB	517036		WA			X				

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

2 Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

3 Analyzed for cyanide only

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

It is noted that the Total Organic Carbon (TOC) analysis by method 9060 was subcontracted to STL's Austin, Texas facility, due to a malfunction of the laboratory's TOC instrument, which could not be corrected within the analytical holding time. This does not affect the quality or usability of the data.

During the TKN analyses of the samples in this delivery group, the high-level blank spike analysis (LCS-1) exhibited a percent recovery in excess of control limits. No qualification of data was necessary as all results for TKN analyses were reported as nondetects.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW048, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, sample MMW-44B-T01N-GRW for cyanide analysis was received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect result for this sample was qualified as estimated (UJ), with an indeterminate bias direction. The well designated to sample MW-17-T01N-GRW (lab id 516944) went dry on 02/04/03. Additional sample fractions (lab id 516946) were collected the next day (02/05/03) for the analysis of cyanide. According to the data sheets, all analyses with the exception of cyanide were run on lab id 516944.
Holding Times	Yes	NA

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Blanks	No	Several analytes were detected in the volatile and semivolatile blanks. Some tentatively identified compounds were reported as present as well. No volatile data was qualified on the basis of method blank due to the fact that all results were nondetect for all volatile samples. Table 1.1a summarizes the semivolatile blanks detections and resultant data qualifications (limited to those analytes and samples requiring qualification). Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1b summarizes the blank detections and the resultant data qualifications. In all cases, if the value of the result qualified as nondetect was below the reporting limit, the result was qualified as nondetect at the reporting limit (i.e., result raised to reporting limit). Otherwise, the reporting limit was raised to the reported value.
Matrix QC • MS • MS/MSD • LD	N/A	This package did not include any site-specific matrix quality control samples. Note: The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogate • Serial Dilution • Total vs. Partial Analyses • Cation/Anion Balance	No	The internal standards ^{6}Li, ^{45}Sc, ^{89}Y, ^{115}In, ^{159}Tb, and ^{209}Bi recoveries were between 0-0.1 for the ICPMS analyses of samples RB01T-GRW and RB01D-GRW. Therefore, antimony, aluminum, arsenic, barium, beryllium, boron, cadmium, chromium, copper, molybdenum, nickel, potassium, selenium, vanadium and zinc results for these samples, as verified by the run logs, were reported from the trace ICP. The trace ICP reporting limits, for these analytes, met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The water explosives surrogate recovery of S1 (1,2-Dinitrobenzene) for blank sample EBLKE9 (84%) was slightly below the lower end of the acceptable criteria recovery range of 85-116%. No qualification of data was necessary, as blank results are not qualifiable, instead they are used to assess these qualifications. The ICP serial dilution analysis conducted on sample MW-17-T01N-GRWL was not applicable for 17 out of the 24 metals. Of the remaining seven metal analytes, two metals (boron 13.9%, sodium 34.6%) exhibited percent deviations greater than 10%, thereby not satisfying the ≤10% deviation between the original sample and its 5-fold dilution criterion. Accordingly, all results for boron and sodium were qualified as (J/UJ) with a low bias direction for boron and high bias direction for sodium. The orthophosphate concentration of 0.59 mg/L in sample MW-9A-T01N-GRW was greater than its corresponding total phosphorus concentration of 0.028 mg/L. Due to the fact that neither value is greater than 5x the RL (0.010), the absolute difference between the values is compared against an evaluation criterion of ±2x RL. The phosphorus and orthophosphate results for sample MW-9A-T01N-GRW would be qualified as (J/UJ) with an indeterminate direction of bias. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. Two rinsate blanks (RB02-GRW and RB01-GRW) reported percent differences between the cation and anion summations of 17.64% and 19.51% accordingly. The concentrations were low enough that reporting limits controlled the calculations. The balances are therefore not an appropriate measure of accuracy. No qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Rinsate Blank RB02T-GRW (2/5/03) RB02D-GRW (2/5/03) RB01T-GRW (2/5/03) RB01D-GRW (2/5/03) • Field Blank FB04T-GRW • Trip Blank TB137-GRW (2/4/03) TB150 (2/5/03)	N/A	No analytes were detected in any trip blanks associated with this data package. Table 1.2 summarizes analytes detected in the associated rinsate and field blanks. The Field QC results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Laboratory performance parameters were reviewed to provide an overall representation of the analytical system at the time of the analysis. If there was the indication of a systematic problem, the review parameter was evaluated in all data packages analyzed from the laboratory during the same sampling event.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	Several volatile target analytes reported percent differences (%D) between the initial and average RRF and the continuing calibration RRF in excess of 25.0% for two of the three continuing calibration verifications. Table 1.3b summarizes the continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues.
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	No	Although beryllium for this project was reported from the ICP, the data reviewer noted that the ICPMS internal standard, 89Y, used to quantitate 9Be was more that 50 amus from the analyte. For all other elements reported from the ICP/MS, the associated internal standard was within 50 amus of the analyte. As such, this issue is not considered to affect the quality or usability of the data reported from the ICPMS.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	Information regarding the mass resolution is not available due to software limitations. However, acceptable mass resolution can be inferred from the other QC sample results which satisfied evaluation criteria. For the ICPMS analysis of the ICSA solution, antimony, copper and lead were reported as present at a concentration of 1.0 ug/l. However, these analytes are not present in the solution. Although these results suggest a potential high bias in results for these analytes, data qualification was not necessary because none of the samples contained the interferent elements (aluminum and molybdenum) at concentrations comparable to those in the ICS solutions.

Table 1.1a
Semivolatile Blank Detections
Resulting in Data Qualification

Blank	Date	Analyte	Concentration (µg/kg)	Samples Qualified	Qualification and Qualification Codes
SBLKQ4	02/13/03	2-Pentanone,4-Hydroxy-4-Meth[1,2]	7 NJA	MW-17-T01N-GRW	*R
				MMW-44B-T01N-GRW	*R
SBLKK2	02/17/03	2-Pentanone,4-Hydroxy-4-Meth[1,2]	23 NJA	RB01T-GRW	*R
		Bis (2-Ethylhexyl) phthalate	11 J	RB01T-GRW	U MB-I
		Diethylphthalate	1 J	RB01T-GRW	U MB-I

[1]Compound is a tentatively identified compound (TIC). TICs in method blanks are not considered to be reportable as TICs for samples.

[2]Compound is a suspected aldol condensation product of acetone.

*Rejects the identification of the TIC.

Table 1.1b
Metal Blanks

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS)	1.6	1.4	1.4	1.4	1.4	0.600	0.30	*NONE	---
Boron (P)	84	5.0	4.6	3.4	7.3	3.1	2.7	MMW-42B-D01N-GRW MMW-42B-T01N-GRW	U MB,CCB-L
								MW-9A-D01NGRW MW-9A-T01N-GRW	U CCB-L
Molybdenum (P)	-1.2	---	---	---	---	1.100	1.1	*NONE	---

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

*Data qualification was not necessary, as all of the antimony, and molybdenum results were sufficiently higher than 5x the blank concentrations, the results were nondetect, or the target metals were analyzed by trace ICP (arsenic).

Table 1.2
Field Blank Detections

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB01T-GRW	02/05/03	Total dissolved solids	37.0	5.0
		Bicarbonate alkalinity	2.7	1.0
		Total alkalinity	2.7	1.0
		Ammonia-nitrogen	0.067	0.040
		Orthophosphate-p	0.014	0.010
		Total phosphorus	0.013	0.010
		Copper	10.7	1.7
		Acetone	2	10
RB01D-GRW	02/05/03	NONE	All ND	---
RB02T-GRW	02/05/03	Chloride	0.55	0.40
		Bicarbonate alkalinity	2.9	1.0
		Total alkalinity	2.9	1.0
		Ammonia-nitrogen	0.048	0.040
		Orthophosphate-p	0.010	0.010
TB137-GRW*	02/04/03			

*Not included with the data package, but samples are associated with it.

Table 1.3a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	% RSD >25%	Samples Qualified	Qualification and Qualification Codes
SVOC	02/08/03 (1305)	Benzaldehyde	38.2	Results for all samples were qualified as estimated	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.3b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date (Time)	Analyte	% RSD >25%	Samples Qualified	Qualification and Qualification Codes
VOC	02/06/03 (2200)	Acetone	45.0	MW-17-T01N-GRW TB137-GRW	UJ CCAL-I
		2-Butanone	41.0		
		2-Hexanone	41.0		
VOC	02/10/03 (1720)	Acetone	57.5	MMW-44B-T01N-GRW RB01T-GRW TB150-GRW	J CCAL-I or UJ CCAL-I
		2-Butanone	47.2		
		2-Hexanone	41.9		
SVOC	02/13/03 (1555)	2,2'oxybis (1-Chloropropane)	-27.8	MMW-44B-T01N-GRW MW-17-T01N-GRW	UJ CCAL-I
		Hexachlorocyclopentadiene	40.9		
		2,4-Dinitrophenol	45.2		
		4,6-Dinitro-2-methylphenol	26.4		
		Pentachlorophenol	29.8		
		3,3'-Dichlorobenzidine	33.4		
SVOC	02/16/03 (2046)	Isophorone	-57.3	RB01T-GRW	UJ CCAL-I
		Bis (2-Ethylhexyl) phthalate	34.0		
		Indeno(1,2,3-cd) pyrene	-27.5		

CCAL = Initial Calibration RSD = Percent relative standard deviation

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT049 Sampling Event: February 2003

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 04/04/03

Peer Reviewer: Stacey Coker Date Completed: 04/16/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
MMW-44A-T01D-GRW	SA	517072	MMW44AT1DGRW MMW44AT01D	W	X	X	X	X	X		
MMW-44A-D01D-GRW	SA	517073		W	X						
MMW-28A-T01N-GRW	SA	517074	MMW28AT1NGRW MMW28AT01N	W	X	X	X	X	X		
MMW-28A-D01N-GRW	SA	517075		W	X						
TB161-GRW	TB	517076		W			X				
MMW-47A-T01N-GRW	SA	517077	MMW47AT1N W47AT01	W	X	X	X	X	X		
MMW-47A-D01N-GRW	SA	517078		W	X						
FB01T-GRW	FB	517079		W			X	X	X		
MMW-29A-T01N-GRW	SA	517080	MMW29AT01N	W	X	X			X		
MMW-29A-D01N-GRW	SA	517081		W	X						
MMW-45B-T01N-GRW	SA	517082		W	X	X					
MMW-45B-D01N-GRW	SA	517083		W	X						
MMW-45A-T01N-GRW	SA	517084		W	X	X					
MMW-45A-D01N-GRW	SA	517085		W	X						
TB151-GRW	TB	517086		W			X				
MMW-48A-T01N-GRW	SA	517087	MMW48AT1NGRW MMW48AT01N	W	X	X	X	X	X		
MMW-48A-D01N-GRW	SA	517088		W	X						
MMW-44A-T01N-GRW	SA	517089	MMW44AT1NGRW MMW44AT01N	W	X	X	X	X	X		
MMW-44A-D01N-GRW	SA	517090		W	X						
TB153-GRW	TB	517091		W			X				
TB152-GRW	TB	517092		W			X				

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

It is noted that the Total Organic Carbon (TOC) analysis by method 9060 was subcontracted to STL's Austin, Texas facility, due to a malfunction of the laboratory's TOC instrument, which could not be corrected within the analytical holding time. This does not affect the quality or usability of the data.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile organic holding blank was carried through the sample storage period and analyzed with the sample reported in this package. The results for this blank, HBW049, were all nondetect thereby indicating the occurrence of potential cross contamination during sample storage was unlikely.

The laboratory noted manual integration was employed in deriving results for the semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified on the quantitation reports. Included in the data package were the extracted ion current profiles.

The laboratory case narrative noted the nitroaromatic analysis of the blank spike sample (i.e. the laboratory control sample) with this delivery group yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded a percent recovery that was much lower than expected, at 10%. This sample was re-extracted outside the prescribed holding time, yielding a PYX blank spike recovery of 50%, which is outside the default control criterion of 70-130%, but comparable to typical recoveries. Since the LCS recovery of 50% was less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (J/UJ), with a low bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	All samples were run within their prescribed analytical holding times, with the exception of the second analyses for explosives. All explosive samples were re-extracted and re-analyzed due to low PYX recoveries in the initial. All re-extractions were conducted between 13 and 14 days beyond the 7-day holding time specified for extraction. With the exception of PYX, all results from the initial analyses were selected for reporting. The PYX results from the reanalyses were selected for reporting because the associated LCS recovery was considerable better than that for the initial analyses. As such, the PYX results for the second analyses were considered to be of higher quality despite the exceeded holding time.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Blanks	No	Several analytes were detected in the volatile and semivolatile blanks. Some tentatively identified compounds were reported as present as well. Table 1.1a summarizes the volatile and semivolatile blank detections and resultant data qualifications. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1b summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.
Matrix QC • MS/MSD MMW-47A-T01N-GRWMS/D MMW-47A-D01N-GRWMS • PDS MMW-47A-T01N-GRWA MMW-47A-D01N-GRWA • LD MMW-47A-T01N-GRWREP MMW-47A-D01N-GRWREP	No	For the matrix spike analyses on samples MMW-47A-T01N-GRW and MMW-47A-D01N-GRW, several analytes were recovered outside of the acceptance range of 75-125% for inorganics and metals. In addition, several analytes were recovered outside the recovery limits for semivolatiles and explosives. Table 1.2 summarizes these analytes along with the associated percent recoveries and the qualification codes assigned to the parent samples. The matrix quality control results for the March 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Sample concentrations for aluminum, manganese, and zinc were greater than 4x the spiking concentration and were therefore considered inappropriate for assessing accuracy for sample specific matrix affects. There were several instances in which the reporting limits for various metal analytes were increased due to dilution factors but the spike analyte amounts added were not adjusted accordingly. As noted in Table 1.2, it was therefore considered inappropriate for assessing accuracy for sample specific matrix affects for arsenic, cadmium, and iron. Post digestion spikes were performed on the metal analytes that did not meet the specified criterion for the initial matrix spike recoveries. All post digestion spike recoveries for these analytes were within acceptance limits and did not therefore require qualification on this basis. No qualification of data was necessary on the basis of laboratory duplicate criteria for any analysis. For the analytes for which both sample and duplicate sample results were greater than 5x the RL, the RPD was not outside the control criteria of +/-20%. For the remaining analytes, the absolute difference between the sample and duplicate sample result was not greater than 1x the RL for aqueous matrices.
Method QC • Surrogates • Serial Dilution (A) MMW-47A-T01N-GRWL MMW-47A-D01N-GRWL • Total vs. Partial Analyses • Cation/Anion Balance	No	The volatile surrogate recoveries for samples TB151-GRW and MMW-48A-T01N-GRW were flagged by the laboratory as being outside the acceptance limit. The recoveries of bromofluorobenzene for these samples were 115.2% and 115.4%, respectively. As both of these recoveries round to a recovery of 115%, no qualification of data was considered necessary. The surrogate recovery for the explosive analysis was low in sample MMW-47A-T01N-GRW and blank sample EBLKE9. The recoveries of 1,2-dinitrobenzene was 84% for both samples. This recovery is outside the acceptance range of 85-116%, suggesting a potential low bias in the associated sample results. While all results for sample MMW-47A-T01N-GRW (initial analysis) were qualified as estimated (UJ), no qualification was necessary for the blank sample. The internal standard ^{89}Y recoveries were high for the ICPMS analysis of samples MMW-44A-T01D-GRW, MMW-44A-D01D-GRW, MMW-45B-T01N-GRW, MMW-45B-D01N-GRW, MMW-45A-T01N-GRW, MMW-45A-D01N-GRW, MMW-44A-T01N-GRW, and MMW-44A-D01N-GRW. Therefore, molybdenum results for these samples, as verified by the run logs, were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution analyses on samples MMW-47A-T01N-GRW and MMW-

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		47A-D01N-GRW were not applicable for all 24 metal analytes. It was therefore not necessary to qualify any results on the basis of serial dilutions. The copper concentration of 770 µg/L in the filtrate (dissolved) sample MMW-29A-D01N-GRW is greater than the copper concentration 179 µg/L in the corresponding total metals sample, MMW-29A-T01N-GRW. Due to the fact that neither value is greater than 5x the RL (adjusted for a dilution factor of 100 = 170 µg/L), the absolute difference between the two results is compared to an evaluation criterion of 2x the RL. Accordingly, the copper results for both samples were qualified as estimated (J/UJ) with an indeterminate direction of bias. The lead results for MMW-45B-D01N-GRW and MMW-45B-T01N-GRW were qualified as estimated (J/UJ TVP-I) because the dissolved lead result was greater than the total lead result. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion and subsequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate MMW-44A-T01D-GRW MMW-44A-D01D-GRW • Rinsate Blank • Field Blank FB01T-GRW (02/06/03) • Trip Blank TB161-GRW (02/07/03) TB151-GRW (02/06/03) TB153-GRW (02/07/03) TB152-GRW (2/06/03)	N/A	No analytes were detected in three of the four trip blanks. Table 1.3 summarizes detects for the remaining trip blank and the field blank. The Field QC results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial Calibration • VOCs/SVOCs: Continuing Calibration Tables 1.4a and 1.4b summarize the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues.

Table 1.1a
Volatile and Semivolatile Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (µg/L)	Samples Qualified	Qualification and Qualification Codes
VBLKZ8	02/12/03	1,2-Dibromo-3-chloropropane	1 J	FB01T-GRW TB151-GRW	U MB-I
SBLKQ4	02/13/03	4-Hydroxy-4-Methyl 2 Pentanone[1,2]	7 NJA	FB01T-GRW MMW-28A-T01N-GRW MMW-44A-T01D-GRW MMW-44A-T01N-GRW MMW-47A-T01N-GRW MMW-48A-T01N-GRW	Reject identification of TIC
		Unknown Trichloropropene[1]	47 J	FB01T-GRW MMW-28A-T01N-GRW MMW-44A-T01D-GRW MMW-44A-T01N-GRW MMW-48A-T01N-GRW	Reject identification of TIC

[1] Compound is a tentatively identified compound (TIC). TICs in method blanks are not considered to be reportable as TICs for samples.

[2] Compound is a suspected aldol condensation product of acetone

For brevity, the table was limited to blank detections that resulted in data qualification

Table 1.1b
Metal Blanks

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	23.9	47.1 23.5	29.5	31.3	29.5	22.6	22.6	MMW-47A-D01N-GRW MMW-47A-T01N-GRW	U CCB-I
Arsenic (P)	---	---	-3.1	-2.5	---	-4.460	2.3	All samples in this package	UJ MB-I or UJ MB, CCB-I
Boron (P)	7.8	6.1	4.3	7.8	---	2.7	2.7	MMW-44A-T01D-GRW	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Iron (P)	---	38.3	27.3	---	---	-27.95	26.6	All samples in this package with the exception of: MMW-45B-D01N-GRW MMW-45B-T01N-GRW MMW-48A-D01N-GRW MMW-48A-T01N-GRW	UJ MB-I
Molybdenum (P)	---	---	---	---	---	-1.322	1.1	All samples in this package	UJ MB-I
Zinc (P)	---	---	---	---	---	2.864	2.8	NONE	---

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Table 1.2
Matrix Spike Results And Parent Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Comment	Action
MMW-47A-T01N-GRW					
Bicarbonate Alkalinity	40.0%	NA	75-125%	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery	No Qualification
Total Alkalinity	40.0%	NA			
Ammonia-Nitrogen	74.8%	NA		None	J MS-L for parent sample
Arsenic	0.0%	95.8%		Difference between the spike level and dilution adjusted RL is < 1xRL.	No Qualification
Cadmium	0.0%	102.9%		NA because ND and RL > spike level	No Qualification
Chromium	0.0%	103.1%		Difference between the spike level and dilution adjusted RL is < 1xRL.	No Qualification
Iron	0.0%	103.0%		NA because ND and RL > spike level	No Qualification
Nickel	154.9%	105.1%		86.9% if use RL for ND rather than 0 in calculation	No Qualification (parent result is ND)
Cyanide	67.8%	119.2%		None	J MS-L for parent sample
4-Chloro-3-Methylphenol	100% and 103%	NA	73-97%	Recoveries exceeding the upper limit of the acceptance range but <125% are not considered to be indicative of unacceptable accuracy.	No Qualification
4-Nitrophenol	61% and 82%	NA	10-80%		
PYX (Initial) PYX (2nd Extraction)	16% and 8% 7% and 20%	NA	75-125%	Average %Rs > 10%, therefore no rejection.	UJ MS-L for parent sample
MMW-47A-D01N-GRW					
Arsenic	0.0%	99.1%	75-125%	Difference between the spike level and dilution adjusted RL is < 1xRL.	No Qualification
Cadmium	233.8%	101.6%		Difference between the spike level and dilution adjusted RL is < 1xRL.	No Qualification
Copper	175.0%	103.4%		Difference between the spike level and dilution adjusted RL is < 1xRL.	No Qualification
Iron	0.0%	103.7%		NA because ND and RL > spike level	No Qualification
Selenium	146.5%	96.7%		Difference between the spike level and dilution adjusted RL is < 1xRL.	No Qualification
Nickel	151.7%	103.5%		Difference between the spike level and dilution adjusted RL is < 1xRL.	No Qualification

NA = Not appropriate ND = Nondetect

RL = Reporting limit (generally the IDL adjusted for dilution)

IDL = Instrument detection limit

Table 1.3
Field Quality Control Blank Detections

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
FB01T-GRW	02/06/03	Bis(2-ethylhexyl)phthalate	0.004	0.01
		1,2-Dibromo-3-chloropropane	0.001	0.01
TB151-GRW	02/06/03	1,2-Dibromo-3-chloropropane	0.001	0.01

Table 1.4a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	% RSD >25%	Samples Qualified	Qualification and Qualification Codes
SVOC	02/08/03 (1305)	Benzaldehyde	38.2	Results for all samples were qualified as estimated	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.4b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date (Time)	Analyte	% RSD >25%	Samples Qualified	Qualification and Qualification Codes
VOC	02/10/03 (1720)	Acetone	57.7	MMW-28A-T01N-GRW MMW-44A-T01D-GRW MMW-47A-T01N-GRW TB161-GRW	UJ CCAL-I
		2-Butanone	47.2		
		2-Hexanone	41.9		
SVOC	02/13/03 (1555)	2,2'oxybis (1-Chloropropane)	-27.8	Results for all samples were qualified as estimated.	UJ CCAL-I
		Hexachlorocyclopentadiene	40.9		
		2,4-Dinitrophenol	45.2		
		4,6-Dinitro-2-methylphenol	26.4		
		Pentachlorophenol	29.8		
		3,3'-Dichlorobenzidine	33.4		

CCAL = Initial Calibration RSD = Percent relative standard deviation

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT050 Sampling Event: February 2003

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter/Ansley Watson Date Completed: 04/04/03 and 1/8/04

Peer Reviewer: Alan Roberts/Stacey Coker Date Completed: 04/10/03 and 1/19/04

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
GWW-1-T01N-GRW	SA	517329	GWW1T01N-GRW	W	X	X			X		
GWW-1-D01N-GRW	SA	517330		W	X						
GWW-2-T01N-GRW	SA	517331	GWW2T01N-GRW	W	X	X			X		
GWW-2-D01N-GRW	SA	517332		W	X						
GWW-3-T01N-GRW	SA	517333	GWW3T01N-GRW	W	X	X			X		
GWW-3-D01N-GRW	SA	517334		W	X						
MMW-49A-T01N-GRW	SA	517335	MMW49AT01NGR	W	X	X			X		
MMW-49A-D01N-GRW	SA	517336		W	X						
MMW-10A-T01N-GRW	SA	517337	MMW10AT01NGR	W	X	X			X		
MMW-10A-D01N-GRW	SA	517338		W	X						
SPRING39PUMP-T01N-GRW	SA	517339	SPRING39PUMP-T01N-GR SPRING39PUMP	W	X	X			X		
SPRING39PUMP-D01N-GRW	SA	517340	SPRING39PUMP-DO1N-G	W	X						
MMW-17A-T01N-GRW	SA	517341		W	X	X					
MMW-17A-D01N-GRW	SA	517342		W	X						
MMW-17B-T01N-GRW	SA	517343		W	X	X					
MMW-17B-D01N-GRW	SA	517344		W	X						
MMW-33A-T01N-GRW	SA	517345		W	X	X					
MMW-33A-D01N-GRW	SA	517346		W	X						
RB01T-SOL	SA	517347		W	X	X		X			X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

It is noted that the Total Organic Carbon (TOC) analysis by method 9060 was subcontracted to STL's Austin, Texas facility, due to a malfunction of the laboratory's TOC instrument, which could not be corrected within the analytical holding time. This does not affect the quality or usability of the data.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory log-in sheet noted the VOC analysis for RB01T-SOL and TB136-SOL (not reported in this data package but associated with RB01T-SOL) were canceled at the clients request. The log-in sheet also noted that the information on the custody records, sample info sheets, sample tags, and labels did not agree. However, there was no explanation provided as to this disagreement, nor was there anything noted upon review of this data package considered reportable or cause for data qualification.
Holding Times	No	The laboratory case narrative noted that several samples in this delivery group were received outside or at the end of the prescribed analytical holding time of 48 hours from the date of sample collection for the nitrate, orthophosphate, and nitrite analyses. Upon reviewing the wet chemistry sample report summaries, it was assessed that all nitrate, orthophosphate, and nitrite analyses were run two days beyond the 48-hour holding time. Accordingly, all nitrate, orthophosphate, and nitrite results were qualified as estimated (J/UJ) with an indeterminate bias direction. The alkalinity analyses of sample MMW-33A-T01N-GRW were accomplished three days beyond the 14-day holding time due to an oversight on behalf of the laboratory. All hydroxide, carbonate, bicarbonate, and total alkalinity results were qualified as estimated (UJ) (all nondetect), with an indeterminate bias direction. The nitroaromatic extractions of the samples in this delivery group were accomplished two days beyond the prescribed holding time of seven days. Due to a typographical error, the QAPP SOP 12.1 Table B.4-3-1a incorrectly listed the sample holding time for explosives (SW-846 8330) as 14 days, as opposed to the correct holding time of seven days until extraction. All analytes for all explosive samples were qualified as estimated (UJ) (all nondetect), with an indeterminate direction of bias. Table 1.1 summarizes the holding time exceedances and the result data qualifications.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Blanks	No	Nitrogen in the form of ammonia was detected in the inorganics method blank sample BLKNH0228C run on 02/28/03. Associated sample results detected at five times this concentration were qualified as nondetect with an indeterminate direction of bias. Table 1.2a summarizes the inorganic method blank detection and the resultant data qualifications. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2b summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. Several analytes were detected in the semivolatile blank SBLKR2. Some tentatively identified compounds were reported as present as well. Table 1.2c summarizes the semivolatile blank detections and the resultant data qualifications. Both target analytes detected in the blank were qualified as nondetect at the reporting limit in the sample. The identification of the TIC in the sample was rejected.
Matrix QC • MS/MSD • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the February 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (A) GWW-1-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery for the explosive analysis was low in blank sample EBLKD9. The recovery of 1,2-dinitrobenzene was 84%. This recovery is outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. No qualification of data was necessary due to the fact that this was a blank sample and all results were nondetect. The internal standard ^{89}Y recoveries were high for the ICPMS analysis of samples GWW-2-T01N-GRW, GWW-2-D01N-GRW, GWW-3-T01N-GRW, GWW-3-D01N-GRW, MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, MMW-33A-T01N-GRW, and MMW-33A-D01N-GRW. Therefore, molybdenum results for these samples, as verified by the run-logs, were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution analysis on sample GWW-1-T01N-GRW was not applicable for 23 out of 24 metal analytes. The remaining metal analyte, manganese, for which the dilution was applicable, did not exhibit a percent deviation between the initial sample result and the 5-fold serial dilution result that was greater than 10%. It was therefore not necessary to qualify any data on the basis of serial dilution. The orthophosphate concentrations of 0.059 mg/L in sample SPRING39PUMP-T01N-GRW and 0.082 mg/L in sample MMW-17A-TO1N-GRW were greater than their phosphorus concentrations of 0.010 mg/L in each sample. Due to the fact that neither partial nor total concentrations for both samples exceeded 5x the RL (0.010), the absolute difference between the partial and total results were compared to an evaluation criterion of ±2x RL. Accordingly, the orthophosphate and phosphorus results for samples SPRING39PUMP-T01N-GRW and MMW-17A-T01N-GRW were qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion and subsequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank RB01T-SOL (02/09/03) • Field Blank • Trip Blank	N/A	Table 1.3 summarizes field QC detects . The Field QC results for the February 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	No	The relative response factor for the series of calibration standards for exceeded the maximum % difference of 25%. Table 1.4 summarizes the continuing calibration results that were outside the evaluation criteria and any resultant data qualification issues.
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	No	The pesticide/PCB analyses of blank spike samples W1LCS and W1LCSD yielded elevated recoveries for several compounds. No qualification was necessary, as the associated samples did not exhibit the presence of any target compounds. The laboratory case narrative noted the nitroaromatic analysis of the blank spike sample with this delivery group yielded generally acceptable recoveries, with the exception of the target compound PYX and PETN, which yielded recoveries below the laboratory control limits. The LCS PETN percent recovery was 72%, with a QC limit requirement of 75-110%. The LCS and LCSD PYX percent recoveries were both 62% with a control criterion of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PETN and PYX results for all samples have been qualified as estimated (J/UJ), with a low bias direction.
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	Information regarding the mass resolution is not available due to software limitations. However, acceptable mass resolution can be inferred from the other QC sample results, which satisfied evaluation criteria.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrite as N	Nitrite	Ortho P	OH^- ALK	CO32-ALK	HCO3-ALK	Total ALK
GWW-1-T01N-GRW	5.0 J	0.0050 UJ	0.018 J	---	---	---	---
GWW-2-T01N-GRW	4.3 J	0.0050 UJ	0.025 J	---	---	---	---
GWW-3-T01N-GRW	4.2 J	0.0050 UJ	0.030 J	---	---	---	---
MMW-49-T01N-GRW	3.9 J	0.0050 UJ	0.029 J	---	---	---	---
MMW-10A-T01N-GRW	5.4 J	0.0050 UJ	0.48 J	---	---	---	---
SPRING39PUMP-T01N-GR	1.9 J	0.0050 UJ	0.059 J	---	---	---	---
MMW-17A-T01N-GRW	0.41 J	0.0050 UJ	0.082 J	---	---	---	---
MMW-17B-T01N-GRW	0.41 J	0.0050 UJ	0.010 J	---	---	---	---
MMW-33A-T01N-GRW	4.0 J	0.0050 UJ	0.011 J	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ

Table 1.2a
Inorganic Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (mg/L)	Samples Qualified	Qualification and Qualification Codes
BLKNH0228C	02/28/03	Ammonia-Nitrogen	0.051	GWW-3-T01N-GRW	U MB-I
				MWW-49-T01N-GRW	
				MMW-10A-T01N-GRW	
				SPRING39PUMP-T01N-GRW	
				MMW-17A-T01N-GRW	
				MMW-17B-T01N-GRW	
				MMW-33A-T01N-GRW	
				RB01T-SOL	

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2b

Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	49.9	85.0	99.6	100.5		26.960	22.6	MMW-17A-D01N-GRW, MMW-17A-T01N-GRW, MMW-17B-D01N-GRW, MMW-17B-T01N-GRW	U CCB-I
								RB01T-SOL	U MB, CCB-I
								SPRING39PUMP-D01N-GRW, SPRING39PUMP-T01N-GRW	U CCB-I
Arsenic (P)	-6.3			-4.1		-2.973	2.3	GWW-1-D01N-GRW, GWW-1-T01N-GRW, GWW-2-D01N-GRW, GWW-2-T01N-GRW, GWW-3-D01N-GRW, GWW-3-T01N-GRW, MMW-33A-D01N-GRW, MMW-33A-T01N-GRW, RB01T-SOL	UJ/J CCB-L
Boron (P)	9.1			4.7			2.7	GWW-1-T01N-GRW	UJ CCB-I
Copper (P)				-2.0			1.7	MMW-33A-D01N-GRW, MMW-33A-T01N-GRW, RB01T-SOL	UJ/J CCB-L
Iron (P)						-30.040	26.6	All samples in this SDG.	UJ/J MB-L
Molybdenum (P)		-1.2		-1.5		-1.678	1.1	All samples in this SDG.	UJ/J CCB-L
Potassium (P)	208.6					393.20	201.8	GWW-1-D01N-GRW, GGW-1-T01N-GRW, GGW-2-D01N-GRW, GWW-2-T01N-GRW, GWW-3-D01N-GRW, GWW-3-T01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

*****Data qualification was not necessary, as all of the aluminum, boron, copper, iron, potassium, and sodium results were sufficiently higher than 5x the blank concentrations.

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2c
Semivolatile Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (µg/L)	Samples Qualified	Qualification and Qualification Codes
SBLKR2	02/17/03	Diethylphthalate	1 J	RB01T-SOL	U MB-I
		Bis-(2-Ethylhexyl) phthalate	11		U MB-I

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Field Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB01T-SOL	02/09/03	Chloride	0.54	0.4
		Ammonia	0.095	0.024
		Aluminum	6.8	2.26
		Bis (2-ethylhexyl)phthalate	0.001	0.01
		Diethylphathalate	0.0006	0.01

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.4
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
SVOC	02/16/03 (2046)	Isophorone	-57.3	All sample results were qualified as estimated	UJ CCAL-I
		Indeno (1,2,3-cd)) pyrene	-27.5		

CCAL = Continuing Calibration %D = Percent Difference

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT051 Sampling Event: February 2003

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brice Woodlock Date Completed: 03/19/03

Peer Reviewer: Alan Roberts Date Completed: 04/08/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	BOD	COD
RR-DSSPRING39-T01N-SFW	SA	517353	RR-DSSPRG39-T01N-SFW	W	X	X				X	X
RR-DSSPRING39-D01N-SFW	SA	517354	RR-DSSPRG39-T01N-SFW	W	X						
RR-USSPRING39-T01N-SFW	SA	517355	RR-USSPRG39-T01N-SFW	W	X	X				X	X
RR-USSPRING39-D01N-SFW	SA	517356	RR-USSPRG39-T01N-SFW	W	X						
RR-DSSPRING13-T01N-SFW	SA	517357	RR-DSSPRG13-T01N-SFW	W	X	X				X	X
RR-DSSPRING13-D01N-SFW	SA	517358	RR-DSSPRG13-T01N-SFW	W	X						
RR-USSPRING13-T01N-SFW	SA	517359	RR-USSPRG13-T01N-SFW	W	X	X				X	X
RR-USSPRING13-D01N-SFW	SA	517360	RR-USSPRG13-T01N-SFW	W	X						
SPRING 13 PUMP-T01N-GRW	SA	517534	SPRG13PUMP-T01N-GRW SPRG13PUMPT0	W	X	X			X		
SPRING 13 PUMP-D01N-GRW	SA	517535	SPRG13PUMP-D01N-GRW SPRG13PUMP-D01N-GR	W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

2 Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The Total Organic Carbon (TOC) analysis by method 9060 was subcontracted to STL's Austin, Texas facility. This method was subcontracted due to a malfunction of the Vermont laboratory's TOC instrument, which could not be corrected within the analytical holding time of the samples in this delivery group.

The nitroaromatic analyses of the blank spike samples associated with this delivery group yielded generally acceptable recoveries, with the exception of the target compounds PYX and PETN, which yielded recovery below the default control limits of 75-110%. The laboratory has not yet established control charted control limits for PYX. The QAPP has control limits of 70-130%. PETN is within these limits, whereas PYX (62%) is not. PYX results were qualified J/UJ for all samples for blank spikes having a low bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were problems noted with sample receipt. One cooler was received at 9°C, outside control limits of 4±2°C. This cooler contained samples SPRG13PUMP-T01N and SPRG13PUMP-D01N. These samples were qualified J/UJ for nitrite as nitrogen, nitrate as nitrogen, orthophosphate, and mercury. Other analytes are considered stable at 9°C and weren't considered to require qualification. The laboratory received this cooler intact with custody seals broken. It had been re-taped and the custody seal on the black plastic bag was intact, therefore no qualification of data was necessary based on broken custody seals. BOD analysis was cancelled for all samples at client's request. Upon log-in at the laboratory, samples with SPRING in their ID were truncated to SPRG. The laboratory noted that SPRING 13 PUMP-T01N-GRW for cyanide analysis was received at an improper pH, which may have resulted in possible loss of cyanide. The nondetect result was qualified as estimated (UJ). The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH. A cooler outside control limits of 4±2°C with a temperature of 1.2°C was received at the Austin, TX facility. The samples were not received frozen, therefore no qualification of the TOC analyses was considered necessary.
Holding Times	No	The 48-hour holding times for Nitrate as N, Nitrite as N, and Orthophosphate were not met. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.

Review Parameter	Criteria Met?	Comments
Method Blanks	No	Several metals were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In all cases, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS • MS/MSD • LD	Not Applicable	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the February 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	Recovery for internal standard Y was high for the ICPMS analysis of samples SPRG13PUMP-T01N-GRW, and SPRG13PUMP-T01N-GRW. Therefore, all molybdenum results were reported by trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution analyses were conducted on sample RR-DSSPRG39-T01N-SFW. The percent difference between the original result and result for the diluted sample for calcium did satisfy the <10% criterion. All other analyte serial dilution results were not applicable. The ortho-phosphate result was greater than the total phosphate result for samples RR-DSSPRG13-T01N-SFW and RR-USSPRG13-T01N-SFW. Table 1.3 summarizes these results and the resultant data qualifications.
Field QC Field Duplicate • Rinsate Blank • Field Blank • Trip Blank • Other (e.g., splits)	No	The FD results for the February 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The RB results for the February 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Table 1.5 summarizes the rinsate blank detections.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1. Also, on Form X for the metal instrument detection limits, it was noted that the detection limit was not listed for molybdenum. The laboratory was contacted and a corrected Form X was issued.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	The LCS results for explosives were reviewed as summarized in the case narrative section.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Not Applicable	Package reviewed for sample-specific parameters only.
Initial/Continuing Calibration Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Laboratory Control Sample Results	Not Applicable	Package reviewed for sample-specific parameters only.

Review Parameter	Criteria Met?	Comments
Compound Identification	Not Applicable	Package reviewed for sample-specific parameters only.
Quantification	Not Applicable	Package reviewed for sample-specific parameters only.
Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Not Applicable	Package reviewed for sample-specific parameters only.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite as N	Orthophosphate
RR-DSSPRING39-T01N-SFW	1.1 J	0.005 UJ	0.45 J
RR-USSPRING39-T01N-SFW	1.1 J	0.005 UJ	0.010 UJ
RR-DSSPRING13-T01N-SFW	1.1 J	0.005 UJ	0.44 J
RR-USSPRING13-T01N-SFW	1.1 J	0.005 UJ	0.43 J
SPRING 13 PUMP-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	20.4			31.2	20.5	14.2	RR-DSSPRING39-T01N-SFW RR-DSSPRING39-D01N-SFW RR-USSPRING39-T01N-SFW RR-USSPRING39-D01N-SFW RR-USSPRING13-D01N-SFW	U CCB, MB-I
Antimony (MS)					1.041	0.3	RR-DSSPRING39-T01N-SFW RR-USSPRING13-T01N-SFW	U MB-I
Boron (P)					3.129	2.7	All Samples	U MB-I
Manganese (P)					0.505	0.5	NONE	Data qualification was not necessary, as all aluminum results were either analyzed by ICP/MS or the sample results were sufficiently higher than 5x the blank concentration.
Nickel (P)					1.7	1.5	NONE	
Potassium (P)				274.9		201.8	NONE	

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total versus Partial Summary

Sample	Phosphate		Qualification
	Total as P (ug/L)	Ortho (ug/L)	
RR-DSSPRG13-T01N-SFW	0.073 J	0.44 J	TvP-I

RR-USSPRG13-T01N-SFW	0.015 J	0.43 J	TvP-I

MOLYCORP RI/FS REANALYSIS
DATA REVIEW SUMMARY

Data Package Number: WATRAF2

Sampling Event: Re-analysis February, March April 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 07/08/03

Peer Reviewer: Alan Roberts

Date Completed:

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses
					Fluoride
GOATSEEP-T01N-GRWRE 4/4	SA	529085	GOATSEEP-T01N-GRWR	W	X
GWW-1-T01N-GRWRE 2/8	SA	529086		W	X
GWW-1-T01N-GRWRE 3/5	SA	529087		W	X
GWW-1-T01N-GRWRE 4/1	SA	529088		W	X
GWW-2-T01N-GRWRE 2/8	SA	529089		W	X
GWW-2-T01N-GRWRE 3/5	SA	529090		W	X
GWW-2-T01N-GRWRE 4/1	SA	529091		W	X
GWW-3-T01N-GRWRE 2/28	SA	529092		W	X
GWW-3-T01N-GRWRE 3/5	SA	529093		W	X
GWW-3-T01N-GRWRE 4/1	SA	529094		W	X
MMW-45A-T01N-GRWRE 2/6	SA	529095		W	X
MMW-45A-T01N-GRWRE 3/3	SA	529096		W	X
MMW-45B-T01N-GRWRE 2/6	SA	529097		W	X
MMW-45B-T01N-GRWRE 3/3	SA	529098		W	X
MMW-49A-T01N-GRWRE 2/2	SA	529099		W	X
MMW-49A-T01N-GRWRE 2/8	SA	529100		W	X
MMW-49A-T01N-GRWRE 3/5	SA	529101		W	X
MMW-49A-T01N-GRWRE 4/1	SA	529102		W	X
SPRING13PUMP-T01N-GRWRE 2/12	SA	529103	SPRG13PUMP-T01N-GRW	W	X
SPRING13PUMP-T01N-GRWRE 3/5	SA	529104	SPRG13PUMP-T01N-GRW	W	X
SPRING39PUMP-T01N-GRWRE 2/8	SA	529105	SPRG39PUMP-T01N-GRW	W	X
SPRING39PUMP-T01N-GRWRE 3/5	SA	529106	SPRG39PUMP-T01N-GR	W	X
SPRING39PUMP-T01N-GRWRE 4/1	SA	529107	SPRG39PUMP-T01N-GRW	W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The analytical results in this SDG represent re-analyses performed for groundwater samples collected in February, March, and April 2003. These samples were re-analyzed at dilutions for Fluoride based on Aluminum concentrations of the samples at levels interfering with the fluoride analyses. These results supersede the original sample analyses.

The "RE" suffix has been added to the client identifiers to represent re-analyses.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	A 28-day holding time was exceeded for fluoride by 2-4 months, since these samples were re-analysis results. The fluoride results for all samples in this SDG have been qualified as estimated (J/UJ). The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	Yes	
Matrix QC • MS/MSD/PDS GWW-1-T01N-GRWRE • LD GWW-1-T01N-GRWRE	Yes	This package did include site-specific matrix quality control samples. The matrix quality control results for the sampling events will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Not Applicable	This package did not include any method quality control samples.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Not Applicable	This package did not include any site-specific field quality control samples. The field quality control results for the sampling events will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Not Applicable	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Not Applicable	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WATRAS1 Sampling Event: SFW Re-analyses

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 09/10/03

Peer Reviewer: Stacey Coker Date Completed: 09/12/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[(2)]	Matrix	Analysis
					Metals
RR-14-D01N-SFW	SA	537486		W	X
RR-12-D01N-SFW	SA	537487		W	X
RR-13-D01N-SFW	SA	537488		W	X
RR-13-D01D-SFW	FD	537489		W	X
RR-16-D01N-SFW	SA	537490		W	X
RR-11C-D01N-SFW	SA	537491		W	X
RR-10A1-D01N-SFW	SA	537492		W	X
RR-11A1-D01N-SFW	SA	537493		W	X
RR-7-D01N-SFW	SA	537494		W	X
RR-10-D01N-SFW	SA	537495		W	X
RR-DS-SPRING13-D01N-SFW	SA	537496	RR-DSSPRG13-D01N-SFW-020203	W	X
RR-DS-SPRING13-D01D-SFW	FD	537497	RR-DSSPRG13-D01D-SFW	W	X
RR-DS-SPRING39-D01N-SFW	SA	537498	RR-DSSPRG39-D01N-SFW	W	X
RR-US-SPRING13-D01N-SFW	SA	537499	RR-USSPRG13-D01N-SFW	W	X
RR-US-SPRING39A-D01N-SFW	SA	537500	RR-USSPRG39A-D01N-SFW	W	X
RR-US-SPRING39-D01N-SFW	SA	537501	RR-USSPRG39-D01N-SFW	W	X
RR-DS-SPRING13-D01N-SFW	SA	537502	RR-DSSPRG13-D01N-SFW-020903	W	X
RR-DS-SPRING13-D01N-SFW	SA	537503	RRDSSPG13-D01N-SFW	W	X
RR-US-SPRING13-D01N-SFW	SA	537504	RRUSSPRING13-D01N-SFW	W	X
RR-DS-SPRING39-D01D-SFW	FD	537505	RRDSSPRING-D01D-SFW	W	X

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The analytical results presented in the enclosed submittal represent re-analyses performed for surface water samples collected in January, February and March. These samples were re-analyzed for dissolved Aluminum, dissolved Arsenic and dissolved Cadmium with no dilutions to achieve the lowest possible reporting limit.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	N/A	
Holding Times	No	The 180-day holding time for metals was exceeded by numerous days for the majority of samples. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blank Results	No	Aluminum was detected in the initial calibration and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any matrix spike, post-digestion spike or laboratory duplicates. The matrix QC analyses for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Method QC • Surrogates • Serial Dilution RR-14-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	None of the three metals for the serial dilution analysis on sample RR-14-D01N-GRW were applicable, as all initial sample results were not sufficiently larger (x50) than the IDL (adjusted for dilution).
Field QC • Field Duplicates RR-13-D01D-SFW RR-DS-SPRING13-D01D-SFW RR-DS-SPRING39-D01D-SFW • Rinsate Blank • Field Blank • Trip Blank	Yes	The results for all field duplicate pairs satisfied the concentration-dependent evaluation criteria outlined in SOP 12.1. The parent sample for RR-DS-SPRING39-D01D-SFW was not included in the data package, however, it is included in the WATRAS2 package. The field duplicate pairs between the two data packages satisfy the concentration-dependent evaluation criteria outlined in SOP 12.1. This package did not include any rinsate, field or trip blanks. The field duplicate results for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Nondetect Results w/ Elevated RLs?	N/A	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Results Outside Evaluation Criteria and Resultant Data Qualification

Sample	# of Days in Excess of Holding Time	Metals			Qualification
		Aluminum	Arsenic	Cadmium	
RR-14-D01N-SFW	207	73.6 J	0.20 U	0.84 J	UJ HT-I Or J HT-I
RR-12-D01N-SFW	208	112 J	0.20 U	0.59 J	
RR-13-D01N-SFW	208	126 J	0.20 U	0.56 J	
RR-13-D01D-SFW	208	134 J	0.20 U	0.52 J	
RR-16-D01N-SFW	207	73.2 J	0.20 U	0.77 J	
RR-11C-D01N-SFW	208	158 J	0.20 U	0.62 J	
RR-10A1-D01N-SFW	208	83.2 J	0.20 U	0.33 J	
RR-11A1-D01N-SFW	208	68.5 J	0.20 U	0.25 J	
RR-7-D01N-SFW	209	116 J	0.20 U	0.42 J	
RR-10-D01N-SFW	209	110 J	0.20 U	0.34 J	
RR-DS-SPRING13-D01N-SFW	193	279 J	0.20 U	0.84 J	
RR-DS-SPRING13-D01D-SFW	193	232 J	0.20 U	0.91 J	
RR-DS-SPRING39-D01N-SFW	193	110 J	0.20 U	0.60 J	
RR-US-SPRING13-D01N-SFW	193	128 J	0.20 U	0.66 J	
RR-US-SPRING39A-D01N-SFW	193	90.9 J	0.20 U	0.46 J	
RR-US-SPRING39-D01N-SFW	193	78.4 J	0.20 U	0.53 J	
RR-DS-SPRING13-D01N-SFW	186	119 J	0.20 U	0.75 J	

Table 1.2
Blank Detection Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	ICB (µg/l)	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	21.7	23.9	32.4	34.8	37.5	18.3	RR-14-D01N-SFW RR-12-D01N-SFW RR-13-D01N-SFW RR-13-D01D-SFW RR-16-D01N-SFW RR-11C-D01N-SFW RR-10A1-D01N-SFW RR-11A1-D01N-SFW RR-7-D01N-SFW RR-10-D01N-SFW RR-DS-SPRING39-D01N-SFW RR-US-SPRING13-D01N-SFW RR-US-SPRING39A-D01N-SFW RR-US-SPRING39-D01N-SFW RR-DS-SPRING13-D01N-SFW RR-DS-SPRING13-D01N-SFW RR-US-SPRING13-D01N-SFW RR-DS-SPRING39-D01D-SFW	U CCB-I

MB=Method Blank P=ICP ICB – Initial Calibration Blank CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table is limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE GROUNDWATER AND SURFACE WATER SAMPLES COLLECTED DURING THE MARCH 2003 SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

March 2004

URS

URS Corporation
8181 E. Tufts Avenue
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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Summary of Reanalyses Due to Matrix Related Analyses Issues 2-1

Section 3 Data Review Process 3-1

Section 4 Data Review Narratives 4-1

4.1 Data Review Narratives 4-1
4.2 General Data Quality Issues 4-1
4.2.1 Holding Blanks 4-1
4.2.2 Manual Integration 4-1
4.2.3 Low-Level Detections 4-1
4.2.4 TICs Reported In Blanks 4-1
4.2.5 Dilution Schemes/Non-Detects With Elevated RLs 4-2
4.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses: 4-2
4.2.7 Non-Valid Matrix Spikes 4-2
4.2.8 Laboratory Performance Review (LPR) Findings 4-3

Section 5 Collective Summary/Assessment of Matrix QC Results 5-1

5.1 Matrix Spike Results (Accuracy Evaluation) 5-1
5.1.1 Groundwater Matrix Spike 5-2
5.1.2 Surface Water Matrix Spike 5-3
5.2 Spike Duplicate Results and Laboratory Duplicates (Precision Evaluation) 5-4
5.2.1 Organic Analyses (MS/MSD Relative Percent Difference (RPD) 5-4
5.2.2 Metals and Inorganic Laboratory Duplicates 5-4
5.3 Serial Dilution Results 5-5
5.3.1 Groundwater Serial Dilutions 5-6
5.3.2 Surface Water Serial Dilutions 5-6

Section 6 Collective Summary/Assessment of Field QC Results 6-1

6.1 Field Duplicate Samples 6-1
6.1.1 Groundwater Field Duplicate Results 6-2
6.1.2 Surface Water Field Duplicates Results 6-3
6.2 Rinsate Blank Results 6-3
6.2.1 Groundwater Rinsate Blanks 6-3
6.2.2 Surface Water Rinsate Blanks 6-4
6.3 Field Blank Results 6-5

TABLE OF CONTENTS

Section 7 Overall Data Quality Indicator Assessment 7-1

7.1 Precision 7-1
7.2 Accuracy 7-1
7.3 Completeness 7-1
7.4 Representativeness 7-1
7.5 Comparability 7-2
7.6 Sensitivity 7-2

TABLE OF CONTENTS

Tables

Table 1-1 Summary of March 2003 Groundwater Sample Collection

Table 1-2 Summary of March 2003 Surface Water Sample Collection

Table 2.1 Re-analyses Summary for Water Samples Collected During March, 2003

Table 5-1 Field Samples Chosen for Matrix Spike / Matrix Spike Duplicates

Table 5-2 Count of Matrix Spike Samples Collected in March, 2003

Table 5-3 Matrix Spike / Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Table 5-4 Matrix Spike / Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Table 5-5 Laboratory Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Table 5-6 Laboratory Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Table 5-7 Serial Dilution Outliers and Corresponding Results Qualification for Groundwater Samples

Table 6-1 Water Samples Submitted For Field Duplicate Analyses

Table 6-2 Field Duplicate Collection Frequency for the March, 2003 Sampling Event

Table 6-3 Groundwater Field Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Table 6-4 Rinsate Blanks Collected During the March, 2003 Sampling Event

Table 6-5 Groundwater Rinsate Blank Outliers and Corresponding Results Qualification for Groundwater Samples

Table 6-6 Surface Water Rinsate Outliers and Corresponding Results Qualification for Surface Water Samples

Attachments

Attachment 1.1 Data Package WAT052

Attachment 1.2 Data Package WAT053

Attachment 1.3 Data Package WAT054

Attachment 1.4 Data Package WAT055

Attachment 1.5 Data Package WAT056

Attachment 1.6 Data Package WATRAF2

Attachment 1.7 Data Package WATRAS1

Attachment 1.8 Data Package WATRAS2

This data validation report Comprehensive Assessment is intended to provide the reader with a general overview of the usability of chemical data obtained from the March 2003 sampling activities at Molycorp. In addition, this data validation report is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

This report contains the results of the data validation conducted for groundwater and surface water samples collected in March of 2003 at the Molycorp Questa Mine, Questa, New Mexico. These water samples were collected in support of the Remedial Investigation/Feasibility Study (RI/FS). The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods used and quality control samples collected were in accordance with the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). The results were reported in five original and three re-analyses data packages. Tables 1-1 and 1-2 present a summary of the number of field and quality control samples collected for each analysis type for groundwater and surface water samples, respectively.

Table 1.1
Summary of March 2003 Groundwater Sample Collection

Sample Identification	Dissolved Metals	Total Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
SPRING17-T01N-GRW	X	X	X			
SPRING18-T01N-GRW	X	X	X			
MW-9A-T01N-GRW	X, MS, LD	X, MS, LD	X, MS, LD			
MW-1-T01N-GRW	X, RB	X, RB	X, RB			
MMW-44B-T01N-GRW	X	X	X	X, FB	X, FB	X, FB
MW-17-T01N-GRW	X	X	X	X	X	
MMW-42B-T01N-GRW	X	X	X			
MW-24-T01N-GRW	X	X	X			
MMW-31B-T01N-GRW	X	X	X			X
MW-20-T01N-GRW	X, FD	X, FD	X, FD			
MMW-17A-T01N-GRW	X	X	X			
MMW-47A-T01N-GRW	X, FD	X, FD	X, FD	X, FD	X, FD	X, FD
MMW-17B-T01N-GRW	X	X	X			
MMW-45A-T01N-GRW	X	X	X			
MMW-48A-T01N-GRW	X, MS, LD	X, MS, LD	X, MS, LD	X, MS, LD	X, MS, LD	X, MS, LD
MMW-45B-T01N-GRW	X	X	X			
GWW-1-T01N-GRW	X	X	X			
GWW-2-T01N-GRW	X	X	X			
MWW-29A-T01N-GRW	X	X	X			X
MMW-33A-T01N-GRW	X	X	X			X
GWW-3-T01N-GRW	X	X	X			
MMW-10A-T01N-GRW	X	X	X			X
MMW-44A-T01N-GRW	X	X, RB	X, RB	X, RB	X, RB	X, RB
MMW-28A-T01N-GRW	X	X	X	X	X	X
CC1B-T01N-GRW	X	X	X			
CC2B-T01N-GRW	X	X	X			
SPRING13PUMP-T01N-GRW	X	X	X			
SPRING39PUMP-T01N-GRW	X	X	X			
MMW-49A-T01N-GRW	X	X	X			

Sample Identification	Dissolved Metals	Total Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
Number of GW samples	29	29	29	6	6	9
Number of MS/MSD or MS/LD	2	2	2	1	1	1
Number Field Duplicates	2	2	2	1	1	1
Number Rinsate Blanks	2	2	2	1	1	1
Number Field Blanks	NA	NA	NA	1	1	1

GRW= suffix indicating groundwater sample

FB = Field Blank RB = Rinsate Blank FD = Field Duplicate

MS/MSD = Matrix Spike/Matrix Spike Duplicate

NA= Not Applicable

Notes:

For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

For the field duplicate samples, the "T01N" and "D01N" components of the field ID were replaced with "T01D" and "D01D", respectively.

Table 1.2
Summary of March 2003 Surface Water Sample Collection

Sample Identification	Total Metals	Dissolved Metals	Inorganics	VOC	SVOC	Explosives
RRDSSPRING13-T01N-SFW	X, MS, LD	X, MS, LD	X, MS, LD			
RRUSSPRING13-T01N-SFW	X	X	X			
RRDSSPRING39-T01N-SFW	X, FD	X, FD	X, FD			
RRUSSPRING39-T01N-SFW	X	X	X			
Number SW samples	4	4	4	NA	NA	NA
Number MS/MSD or MS/LD	1	1	1	NA	NA	NA
Number Field Duplicates	1	1	1	NA	NA	NA
Number Rinsate Blanks	1	1	1	NA	NA	NA
Number Field Blanks	NA	NA	NA	NA	NA	NA

NS = Not Sampled FB = Field Blank MS/MSD = Matrix Spike/Matrix Spike Duplicate

RB = Rinsate Blank FD = Field Duplicate

Notes:

For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

For the field duplicate samples, the "T01N" and "D01N" components of the field ID were replaced with "T01D" and "D01D", respectively.

The QAPP required that the quality control samples listed above be collected at a frequency of 5%. As illustrated by the tables, the frequency of QC analyses was satisfied for each analysis type for each matrix.

During review of the October and December 2002 groundwater and surface water data sets, it became apparent that there were matrix-related analysis problems. The serial dilution results, comparisons with historical results, and charge balances suggested that matrix-related issues existed for the fluoride analysis. The laboratory conducted several studies in order to determine analysis solutions to the matrix related analysis problems. Each analysis problem, investigation, and solution is described in detail in the Data Validation Report for the Fall 2002 groundwater and surface water samples. As a result of these matrix related analysis problems and subsequent studies, various samples required reanalysis, as summarized below.

- All March 2003 samples for which the aluminum concentrations were greater than 3 mg/L were reanalyzed for fluoride. For the reanalyses, samples were diluted based on the aluminum concentration prior to addition of the chelating buffer.
- The surface water samples were reanalyzed for aluminum, arsenic and cadmium without dilution in order to attain the lowest reporting limits possible. The results for the reanalyses were selected for reporting and the data sheets were annotated accordingly.

A summary of the March 2003 samples which were reanalyzed is provided in the following table. The table includes a listing of the data package in which the original results were reported and the data package in which the reanalysis results are reported.

Table 2.1
Re-analyses Summary for Water Samples Collected During March, 2003
Molycorp Site

Site ID	Dissolved Metals	Fluoride	Original SDG
GWW-1-T01N-GRW		WATRAF2	WAT054
GWW-2-T01N-GRW		WATRAF2	WAT054
GWW3-T01N-GRW		WATRAF2	WAT054
MMW-45A-T01N-GRW		WATRAF2	WAT053
MMW-45B-T01N-GRW		WATRAF2	WAT053
MMW-49A-T01N-GRW		WATRAF2	WAT056
SPRING13PUMP-T01N-GRW		WATRAF2	WAT056
SPRING39PUMP-T01N-GRW		WATRAF2	WAT056
RR-DS-SPRING13-D01N-SFW	WATRAS1		WAT055
RR-US-SPRING-D01N-SFW	WATRAS1		WAT055
RR-DS-SPRING39-D01D-SFW	WATRAS1		WAT055
RR-US-SPRING39-D01N-SFW	WATRAS2		WAT055
RR-DS-SPRING39-D01N-SFW	WATRAS2		WAT055

As noted in Section 4, the results for the reanalyses were reviewed in the same fashion as the original analyses. As a result of this review, the results obtained for reanalyses were selected for reporting.

Additionally, the filtered surface water samples were re-analyzed for dissolved aluminum, arsenic, and cadmium without dilution to address data usability issues. The results of these reanalyses were reported in three data packages, WATRAS1, and WATRAS2. The results were reviewed in accordance with SOP 12.1. The fluoride reanalyses were conducted because the dilution for the original analyses was not sufficient to lower the aluminum concentration below 3 mg/l. As such the samples were reanalyzed for fluoride using an appropriate dilution to reduce

the aluminum interference. The results were reported in WATRAF2. The reanalyses results were selected for reporting and the original results were rejected. The data sheets were annotated accordingly.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, Inductively Coupled Plasma Spectroscopy (ICP) serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1, and is as follows: If no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used. If no criteria are specified in the SOP or the QAPP then the method-specified acceptance limits were used. If no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

Whenever professional judgment was exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative. As outlined in Section 2, some samples were reanalyzed for fluoride due to matrix conditions unique to the Molycorp Site. The reanalysis packages received the same review as the original packages. In all cases, the reanalysis results supercede those that were initially reported. Section 4 Attachment 1 provides the data review narratives for each of the data packages, including the reanalysis packages.

After completing the review sample-specific and laboratory performance parameters in accordance with SOP 12.1, the site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. The reason for this is that site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC

measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 5.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Where applicable, the potential direction of bias (high, low, or indeterminate) has been indicated on the tables in the text, and noted on the sample results sheets as H, L, or I, respectively. Section 6.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 7.0

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

4.1 DATA REVIEW NARRATIVES

The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries, which are included in Attachment 1. The data qualifiers, reason codes, and bias codes have been marked on the data sheets, which are retained in the project files. The data validation qualifiers reason codes and bias codes are also stored in the electronic database.

4.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identified whether findings globally affect all relevant water samples analyzed for the May 2003 Groundwater and Surface Water Sampling Event. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

4.2.1 Holding Blanks

For the analysis of the volatile organic samples, a holding blank was carried through the sample storage period and analyzed in the same sequence as the samples in the data package. As all holding blank recoveries were all nondetect, the indication of the occurrence of potential cross-contamination during sample storage was unlikely.

4.2.2 Manual Integration

Manual integration was employed in deriving results for the volatile and semivolatile organics in a few data packages. The values that were derived from manual integration were qualified on the quantitation reports and extracted ion current profiles were included for each instance. The supporting documentation provided was reviewed and found to be adequate.

4.2.3 Low-level Detections

Detected organic analytes with concentrations between the Method Detection Limit (MDL) and the Reporting Limit (RL) were qualified as estimated (J). A qualifier code of “SQL-I” (Sample Quantitation Limit) was assigned to reflect the greater uncertainty in quantitative values below the RL.

4.2.4 TICs Reported in Blanks

Several Tentatively Identified Compounds (TICs) were reported as present in the semivolatile blanks for each package. The unknown compounds detected in the method blank were qualified as (NJ) to denote the analyses indicated the presence of an analyte that had been “tentatively identified” and the associated numerical value represented its approximate value. However, if similar TICs were present in the associated samples, the results were not considered to be

reportable due to laboratory contamination (as indicated by the blank) and therefore, flagged as unusable (R). After evaluating sample TICs based on laboratory method blanks, any remaining TICs were qualified as "NJ."

4.2.5 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

4.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses:

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

4.2.7 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

4.2.8 Laboratory Performance Review (LPR) Findings

As mentioned previously, one data package, WAT052, was given a full validation to assess the performance of the laboratory for all analyses. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated for all packages for this event included:

- Initial calibration results for VOCs and SVOCs
- Continuing calibration results for VOC and SVOCs
- Laboratory control sample results for PYX

The site-specific Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, method duplicate (MD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three sections present a discussion on the MS/MSD analyses, MD analyses, and the serial dilution results for the groundwater and surface water samples collected during the March 2003 sampling event.

5.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Additional aliquots of 2 groundwater and 1 surface water sample were submitted for use in matrix QC analyses. Table 5-1 below summarizes the site-samples that were used to prepare matrix spike and matrix spike duplicate samples.

Table 5-1
Field Samples Submitted for Matrix Spike/Matrix Spike Duplicates

Sample ID	Matrix	Data Package	Analysis					
			Total Metals	Dissolved Metals	Wet Chemistry	Volatile Organics	Semivolatile Organics	Explosives
MW9A-T01N-GRW	Groundwater	WAT052	x	x				
MMW-48A-T01N-GRW	Groundwater	WAT053	x	x	x	x	x	x
RR-DS-SPRING13-T01N-SFW	Surface water	WAT055	x	x	x			

Notes:

For metals and inorganic analyses, a single matrix spike sample was analyzed.

For organic analyses, duplicate matrix spike samples were analyzed.

The following table summarizes the number of groundwater and surface water MS/MD sample sets relative to the number of field samples.

Table 5-2
Count of Matrix Spike Samples Collected in March, 2003

Analyses	Number of MS Samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	2	29	7
Dissolved Metals	2	29	7
Wet Chemistry	2	29	7
VOC	1	6	16
SVOC	1	5	20
Explosives	1	10	10
Surface Water			
Total Metals	1	4	25
Dissolved Metals	1	4	25
Wet Chemistry	1	4	25
VOC	0	0	NA
SVOC	0	0	NA
Explosives	0	0	NA

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

In general, qualification was limited to the parent sample if fewer than a quarter of the applicable matrix spike recoveries were outside the acceptance range. Conversely, if more than a quarter of the applicable matrix spike recoveries were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average matrix spike recovery, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

5.1.1 Groundwater Matrix Spike

Although the vast majority of matrix spike recoveries were within acceptance limits, some were not. Table 5-3 summarizes the groundwater spike recoveries that were outside acceptance limits and the subsequent result qualification applied to the associated samples.

Table 5-3
Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte (Control Limits %)	Sample ID	MS or MS and MSD Recovery	Frequency of Limit Exceedance	Action
Metals				
Dissolved Arsenic (75-125)	MMW-48A-D01N-GRW	128	1 of 2 (1 of 2 for dissolved)	All positive dissolved arsenic results were qualified as estimated (J MS-H).
Dissolved Iron (75-125)	MW-9A-D01N-GRW	41.2	1 of 2 (1 of 2 for dissolved)	All dissolved iron results were qualified as estimated (J/UJ MS-L).
Total Selenium (75-125)	MMW-48A-T01N-GRW	72.3	1 of 2 (1 of 2 for total)	All total selenium results were qualified as estimated (J/UJ MS-L).
Total Cyanide	MMW-48A-T01N-GRW	73.1	1 of 2 (1 of 2 for total)	All cyanide results were qualified as estimated (J/UJ MS-L).
Wet Chemistry				
Biocarbonate alkalinity	MW-9A-T01N-GRW	0.0	1 of 2	None[1]
TOC (75-125)	MW-9A-T01N-GRW	160	1 of 2	All positive TOC results were qualified as estimated (J MS-H).
Phosphorus (75-125)	MW-9A-T01N-GRW	20.8	2 of 2	All phosphorus results were qualified as estimated (J/UJ MS-L).
	MMW-48A-T01N-GRW	52.0		
VOC All results were within criteria				
SVOC All results were within criteria				
Explosives				
PETN (75-110)	MMW-48A-T01N-GRW	74 and 70	2 of 2	All PETN results were qualified as estimated (J/UJ MS-L).
PYX (70-130)	MMW-48A-T01N-GRW	62 and 55	2 of 2	All PYX results were qualified as estimated (J/UJ MS-L).

[1] Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the accepted range of 75-125% in the sample specific reviews. However, using professional judgement, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses are not a pertinent measure of accuracy. The highly variable pH range of the water and the associated carbonate species equilibria was found to affect the matrix spike recoveries more than the expected accuracy of the analysis. The matrix spiked samples were found to have significantly different pHs than the parent samples, due to the presence of carbonate confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy of the analysis.

For each of the analytes listed in the table above, it was considered necessary to extend qualification to the balance of the March 2003 groundwater samples data set because more than a quarter of the spike results were outside acceptance limits suggesting a potentially generalized matrix effect due to the nature of the samples.

Although result for some analytes were qualified based on matrix spike recoveries, none warranted rejection. Additionally the vast majority (>95%) of matrix spike result were within acceptance limits. As such the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

5.1.2 Surface Water Matrix Spike

Although the vast majority of matrix spike recoveries were within acceptance limits, some were not. Table 5-4 summarizes the surface water spike recoveries that were outside acceptance limits and the subsequent result qualification applied to the associated samples.

Table 5-4
Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Analyte (Control Limits %)	Sample ID	MS %R	Frequency of Limit Exceedance	Action
Metals				
Total Iron (75-125)	RR-DSSPRING13-T01N-SFW	153.8	1 of 1	None, all total iron results were nondetect.
Wet Chemistry				
Ammonia (75-125)	RR-DSSPRING13-T01N-SFW	69.8	1 of 1	All ammonia results were qualified as estimated (J/UJ MS-L)
Bicarbonate Alkalinity (75-125)	RR-DSSPRING13-T01N-SFW	2.0	1 of 1	None[1]

[1] Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the accepted range of 75-125% in the sample specific reviews. However, using professional judgement, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses are not a pertinent measure of accuracy. The highly variable pH range of the water and the associated carbonate species equilibria was found to affect the matrix spike recoveries more than the expected accuracy of the analysis. The matrix spiked samples were found to have significantly different pHs than the parent samples, due to the presence of carbonate confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy of the analysis.

For each of the analytes listed in the table above, it was considered necessary to extend qualification to the balance of the March 2003 surface water samples data set because more than a quarter of the spike results were outside acceptance limits suggesting a potentially generalized matrix effect due to the nature of the samples.

Although result for some analytes were qualified based on matrix spike recoveries, none warranted rejection. Additionally the vast majority (>95%) of matrix spike result were within acceptance limits. As such the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

5.2 SPIKE DUPLICATE RESULTS AND LABORATORY DUPLICATES (PRECISION EVALUATION)

The following subsections pertain to the precision of analytical results based upon their reproducibility. Section 5.2.1 discusses the organic analyses for which precision was evaluated by analysis of duplicate spiked samples. Section 5.2.2 discusses the metals and inorganic analyses for which precision was evaluated by analysis of laboratory duplicate.

5.2.1 Organic Analyses (MS/MSD Relative Percent Difference (RPD)

The relative percent differences between MS and MSD results for target analytes contained in the spiking solutions used by the laboratory for groundwater samples were within QAPP acceptance limits. No groundwater results were qualified based on the RPD between the MS and the MSD results. As such, the precision of the organic analyses relative to the site specific matrix is considered to be acceptable.

5.2.2 Metals and Inorganic Laboratory Duplicates

The laboratory duplicate sample analysis results are used to evaluate the precision of the laboratory analyses. The evaluation criteria used are dependent on the concentration of the analyte in the sample. Acceptable precision is demonstrated by an RPD<20% when both results are more that five times the reporting limit (RL). When either sample concentration is <5xRL, acceptable precision is demonstrated by an absolute difference between results of < 1xRL. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was used as the RL for these concentration dependent evaluations because the laboratory reported used the IDLs as the quantitative RLs. The IDLs are considered to be too low for such comparisons to be meaningful. Additionally, using the CLP CRDL is consistent with The National Functional Guidelines, which were used as guidance for data review in addition to SOP 12.1.

5.2.2.1 Groundwater Laboratory Duplicate

With the following exceptions, all laboratory duplicate recoveries were within the laboratory acceptance limits. Table 5-5 below lists the groundwater laboratory duplicate results outside the laboratory acceptance limits and the result qualifiers applied.

Table 5-5
Laboratory Duplicate Outliers and Corresponding Results
Qualification for Groundwater Samples

Analyte	Sample ID	RPD or Difference	Frequency of Limit Exceedance	Action
Metals All results were within criteria				
Wet Chemistry				
TOC	MMW-9A-T01N-GRW	RPD= 34.5%	1 of 2	All TOC results were qualified as estimated (J/UJ D-I).
Ammonia	MMW-48A-T01N-GRW	RPD= 43.9%	1 of 2	All ammonia results were qualified as estimated (J/UJ D-I.)

Evaluation criteria are RPD ≤ 20% or absolute difference ≤ 1 x RL.

The TOC and ammonia results for all groundwater samples were qualified as estimated on the basis of laboratory duplicate results. As more than a quarter of the duplicate measurements were out for these two parameters, suggesting some analytical imprecision despite a generally more homogenous sample matrix, it was considered necessary to qualify results for all groundwater samples on the basis of laboratory duplicate results.

5.2.2.2 Surface Water Laboratory Duplicate

With the following exceptions, all laboratory duplicate recoveries were within the laboratory acceptance limits. Table 5-6 below lists the surface water laboratory duplicate results outside the laboratory acceptance limits and the qualification applied, if necessary.

Table 5-6
Laboratory Duplicate Outliers and Corresponding Results
Qualification for Surface Water Samples

Analyte (20% or 1xRL)	Sample ID	RPD or Difference as a function of the RL	Frequency of Limit Exceedance	Action
Metals				
Dissolved Molybdenum	RR-DSSPRING13-D01N-SFW	RPD=35.5%	1 of 1	Dissolved molybdenum results for all samples were qualified as estimated (J/UJ D-I)
Wet Chemistry All results were within criteria				

Evaluation criteria are RPD ≤ 20% or absolute difference ≤ 1 x RL.

The majority of laboratory duplicate results indicate overall acceptable precision. Dissolved molybdenum results were outside evaluation criteria, therefore all dissolved molybdenum results were qualified as estimated (J/UJ D-I).

5.3 SERIAL DILUTION RESULTS

ICP serial dilutions are analyzed to help evaluate whether or not interferences exist due to sample matrix. When analyte concentrations are sufficiently high (defined as minimally 50x greater than the instrument detection limit [IDL]), results for a straight five fold dilution are expected to agree within 10%. Otherwise, interferences resulting in suppression or enhancement might be suspected.

In general, qualification was limited to the parent sample if fewer than a quarter of the applicable serial dilution results were outside the acceptance range. Conversely, if more than a quarter of the applicable serial dilution results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average %D, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

5.3.1 Groundwater Serial Dilutions

Table 5-7 below lists the number of applicable groundwater samples that were used to perform serial dilution tests and analytes for which the evaluation was applicable. With three exceptions denoted in the table below, the percent differences (%Ds) between the original sample results and the result obtained from a five-fold diluted sample were all <10%.

Table 5-7
Serial Dilution Outliers and Corresponding Results
Qualification for Groundwater Samples

Analyte[1]	Number of Serial Dilution Samples Analyzed	Number of Valid Results	%Ds >10%	Potential Bias Direction		Action
				Low	High	
Total Calcium	4	1	1	1	0	All calcium results were qualified as estimated J/UJ DL-L
Dissolved Calcium	2	1	1	1	0	
Total Zinc	4	1	1	1	0	All Total zinc results were qualified as estimated J/UJ DL-L

[1] The table is limited to analytes for which the serial dilution results were outside evaluation criteria.

Data qualification was issued to positive for calcium and zinc results because greater than a quarter of the applicable results were outside the evaluation criterion. The calcium and zinc results were qualified as estimated with a potential high bias (J DL-L).

5.3.2 Surface Water Serial Dilutions

Only serial dilution analyte concentrations greater than the IDL multiplied by 50 and any applicable dilution factors are appropriate for comparing to the evaluation criteria. Because none of the analytes were applicable to this criterion, no qualifications of surface water data were necessary.

The site-specific field duplicate samples, rinsate blanks and field blanks were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrices. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

6.1 FIELD DUPLICATE SAMPLES

The field duplicate sample analysis results may be used to evaluate the overall precision of the analyses (analytical and sampling precision) and/or the sample representativeness. The following concentration dependent evaluation was used. Where both results were greater than or 5 times the Reporting Limit (RL), the Relative Percent Difference (RPD) between the results was compared to a criterion of <25%. If either result was less than 5 times the RL, the absolute difference was compared to a criterion of <2xRL. Similar to laboratory duplicate evaluations, the CRDL was used as the RL for these comparisons.

In general, qualification was limited to the parent sample if fewer than a quarter of the field duplicate results were outside the acceptance range. Conversely, if more than a quarter of the field duplicate results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the magnitude of the exceedances (marginal vs. gross) and the complexity of the sample matrix.

Field duplicate samples were collected during this sampling event for metals, wet chemistry, Volatile Organic Compounds (VOCs), Semivolatile Organic Compounds (SVOCs), and explosives. Tables 6-1 and 6-2 below summarize the field duplicate samples collected and the frequency of field duplicate collection per matrix and analysis type, respectively.

Table 6-1
Water Samples Submitted for Field Duplicate Analyses

Sample ID	Matrix	Data Package	Analysis					
			Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
MW-20-T01N-GRW/MW-20-T01D-GRW	Groundwater	WAT052	x	x	x			
MMW-47A-T01N-GRW/MMW-47A-T01D-GRW	Groundwater	WAT053	x	x	x	x	x	x
RRDSSPRING39-T01N-SFW/RRDSSPRING39-T01D-SFW	Surface water	WAT055	x	x	x			

Table 6-2
Field Duplicate Collection Frequency for the March, 2003 Sampling Event

Analyses	Number of FD Samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	2	29	7
Dissolved Metals	2	29	7
Inorganics	2	29	7
VOC	1	6	16
SVOC	1	5	20
Explosives	1	10	10
Surface Water			
Total Metals	1	4	25
Dissolved Metals	1	4	25
Inorganics	4	4	25
VOC	0	0	NA
SVOC	0	0	NA
Explosives	0	0	NA

As shown on the above table, the 5% (or 1 in 20) frequency specification for field duplicates was met for the groundwater and surface water samples collected in March 2003.

6.1.1 Groundwater Field Duplicate Results

The groundwater field duplicate results outside the evaluation criteria and resultant data qualification are summarized in Table 6-3 below.

Table 6-3
Groundwater Field Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Sample ID	Analyte	RPD or Difference	Comment	Action
Metals All results were within criteria				
Inorganics				
MMW-47A-T01N-GRW/ MMW-47A-T01N-GRW	TSS	RPD=90%	1 of 2	J/UJ FD-I for all samples.
VOC All results were within criteria				
SVOC All results were within criteria				
Explosives All results were within criteria				

The field duplicate RPDs were outside evaluation criteria for TSS. Since greater than a quarter of the field duplicates were outside criteria for TSS all groundwater sample results for this parameter were qualified as estimated (J/UJ FD-I).

6.1.2 Surface Water Field Duplicates Results

All field duplicate results were within evaluation criteria for surface water samples, therefore, no qualifications of data were necessary.

6.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. The table below lists the rinsate blanks that were collected during the March 2003 sampling event and the parameters for which they were analyzed.

Table 6-4
Rinsate Blanks Collected During the March, 2003 Sampling Event

Sample ID (Date)	Matrix	Data Package	Analysis					
			Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
RB01T -GRW (03/04)	Groundwater	WAT052	x	x[1]	x			
RB01T-GRW (03/06)	Groundwater	WAT054	x		x	x	x	x
RB01T-SFW (03/07)	Surface Water	WAT055	x	x[1]	x			

[1] The "T" in the field ID was changed to "D" for dissolved metals.

The QAPP required frequency of 5% for the collection of rinsate blanks was met for the March, 2003 water sampling event.

6.2.1 Groundwater Rinsate Blanks

The rinsate blank detections results and the resulting data qualification issued is summarized in the following table. To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result or biasing the average high by using the reporting limit.

Table 6-5
Groundwater Rinsate Blank Outliers and Corresponding Results Qualification for Samples Collected during March, 2003

Analyte	Sample ID	Conc.	Ave. Conc.	RL	Frequency of Detection	Range for Field Samples	Action
Metals (µg/l)							
Total Antimony	RB01T-GRW (03/06)	30	22.0	28	1 out of 2	6-31.8 µg/L	Total antimony results <75.8 µg/L were qualified as nondetect (U RB-I).
Dissolved Metals (µg/l) All rinsate blanks were non-detect							
Inorganic Parameters (mg/L)							
TDS	RB01T-GRW (03/04)	46	33.0	10	2 of 2	240-4330 µg/L	None because all sample concentrations were >165 mg/L.
	RB01T-GRW (03/06)	20		10			
Bicarbonate Alkalinity and Total Alkalinity	RB01T-GRW (03/04)	2.8	2.65	1	2 of 2	1-440	All bicarbonate alkalinity results<13.3 mg/L were qualified as nondetect (U RB-I).
	RB01T-GRW (03/06)	2.5		1			
	RB01T-GRW (03/06)	2.5		1			
Ammonia as N	RB01T-GRW (03/04)	0.052	0.05	0.04	2 of 2	0.04-0.11	All ammonia as N results <0.25 mg/L were qualified as nondetect (U RB-I).
	RB01T-GRW (03/06)	0.048		0.04			
Phosphorus	RB01T-GRW (03/04)	0.02	0.013	0.01	1 of 2	0.01-0.24	All phosphorus results <0.065 mg/L were qualified as nondetect (U RB-I).
TOC	RB01T-GRW (03/06)	1.5	1.0	1	1 of 2	1-5	All TOC results <5.0 mg/L were qualified as nondetect (U RB-I).
VOC (µg/L) All rinsate blank results were non-detect.							
SVOC (µg/L) All rinsate blank results were non-detect.							
Explosives (µg/L) All rinsate blank results were non-detect.							

ND= Nondetect MDL=Method Detection Limit RL= Reporting Limit

While some results were qualified as nondetect based on rinsate blank results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

6.2.2 Surface Water Rinsate Blanks

The surface water rinsate blank results and their effects regarding groundwater results qualification are provided in the following table:

Table 6-6
Surface Water Rinsate Blank Outliers and Corresponding Results
Qualification for Surface Water Samples

Analyte	Sample ID	Conc.	Ave. Conc.	RL	Frequency of Detection	Range for Field Samples	Action
Metals (µg/l)							
Inorganic Parameters (mg/L)							
TDS	RB01T-SFW (03/05)	28	28	10	1 of 1	28-274 mg/L	All TDS results <140 mg/L were qualified as nondetect (U RB-I).
Bicarbonate Alkalinity and Total Alkalinity	RB01T-SFW (03/05)	2.7	2.7	1	1 of 1	1.7-43.0 mg/L	All bicarbonate alkalinity results <13.5 mg/L were qualified as nondetect (U RB-I).
Ammonia as N	RB01T-SFW (03/05)	0.060	0.060	0.04	1 of 1	0.052-0.13 mg/L	All ammonia as N results <0.30 mg/L were qualified as nondetect (U RB-I).

While some results were qualified as nondetect based on rinsate blank results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

6.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. In accordance with the project QAPP, field blanks were only required for organic parameters. Field blanks were generated by pouring laboratory-supplied reagent grade water into certified pre-cleaned sample containers at the sample collection site.

Of the VOC, SVOC and explosive compounds analyzed for in field blanks FB01T-GRW (03/05), all were nondetect. Therefore no qualifications of data were necessary.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank contamination. In addition, some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summaries. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

7.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

Of 215 lab duplicate results, 212 satisfied the applicable evaluation criteria, for a total of 99 %. Of 269 field duplicate results, 268 satisfied the applicable evaluation criteria, for a total of 99 %. As such, the overall level of precision, both analytical and combined analytical and sampling, demonstrated is considered to be acceptable.

7.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of Laboratory Control Samples (LCSs) and MSs.

Ninety-five percent of the MS recoveries (219 valid of 231 recoveries) satisfied the applicable evaluation criteria for accuracy specified in the QAPP, indicating that acceptable overall accuracy was attained with respect to the site matrix.

7.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements in relation to the number of measurements requested.

There were 4 surface water and 29 groundwater samples collected during the March 2003 sampling event. All samples yielded valid results for all target analytes, consequently the completeness achieved was 100%.

7.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting Field Sampling Plan FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the biota samples. The close agreement between the field duplicate results, as discussed above in Section 6.1, indicates that the samples collected were adequately representative of the medium sampled.

Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. Again, the close agreement between duplicates noted in Section 6.1 indicates that sample processing and subsampling procedures were acceptable.

7.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

7.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. As such, obtaining some nondetect results with elevated reporting limits was not avoidable. While it is anticipated that all data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT052C

Sampling Event: March 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

LP Reviewer: Brian Olmsted

Date Completed: 01/30/04

Data Reviewer: Ansley Watson

Date Completed: 04/21/03

Peer Reviewer: Stacey Coker

Date Completed: 04/23/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Metals	Inorganics	VOC	SVOC	Explosives
MW-9A-T01N-GRW	SA	518302		W	X	X			
MW-9A-D01N-GRW	SA	518303		W	X				
MW-1-T01N-GRW	SA	518304		W	X	X			
MW-1-D01N-GRW	SA	518305		W	X				
RB01T-GRW	RB	518306		W	X	X			
RB01D-GRW	RB	518307		W	X				
TB156-GRW	TB	518308		W			X		
TB157-GRW	TB	518309		W			X		
FB01T-GRW	FB	518310		W			X	X	X
MMW-44B-T01N-GRW	SA	518311	MMW44BT1NGRW and MMW44BT01NGRW and MMW44BT01NGR	W	X	X	X	X	X
MMW-44B-D01N-GRW	SA	518312		W	X				
MW-17-T01N-GRW	SA	518313	MW17T01NGRW	W	X	X	X		
MW-17-D01N-GRW	SA	518314		W	X				
MMW-42B-T01N-GRW	SA	518315		W	X	X			
MMW-42B-D01N-GRW	SA	518316		W	X				
MW-24-T01N-GRW	SA	518317		W	X	X			
MW-24-D01N-GRW	SA	518318		W	X				
MMW-31B-T01N-GRW	SA	518445		W	X	X			X
MMW-31B-D01N-GRW	SA	518446		W	X				
MW-20-T01N-GRW	SA	518447		W	X	X			
MW-20-D01N-GRW	SA	518448		W	X				
MW-20-T01D-GRW	FD	518449		W	X	X			
MW-20-D01D-GRW	FD	518450		W	X				

Matrix:	S = Solid	W = Water	B = Biota		
QC Type:	SA = Sample	TB = Trip Blank	RB = Rinsate Blank	FB = Field Blank	FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

It is noted that the Total Organic Carbon (TOC) analysis by method 9060 was subcontracted to STL's Austin, Texas facility, due to a malfunction of the laboratory's TOC instrument, which could not be corrected within the analytical holding time. This does not affect the quality or usability of the data.

The laboratory case narrative noted the high level blank spike (LCS1) exhibited a percent recovery that exceeded control limits for TKN. Upon further inspection into the raw data sheets, it was determined that two laboratory control standards were run (LCS1 and LCS2). TKN was recovered in LCS1 at 131.8% and in LCS2 at 113.6%. The control limit for LCS percent recovery established by the laboratory is 80-120%, whereas the QAPP specifies 75-125%. All results for TKN were nondetect with the exception of sample RR-DSSRING-13-T01D-SFW. The TKN result for this sample was not qualified due to the fact that the matrix spike recovery for TKN was 95%, thereby demonstrating a low effect of site-specific sample matrix on the accuracy of the analysis.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

The metals analysis of the continuing calibration check standard, designated CCV5, yielded a 89.2% recovery for cadmium that was marginally below the established control limit of 90-110%. Due to the fact that the CCV5 was only associated with matrix spike sample RR-DSSPRING-39-D01N, as verified by the metals run log, no re-analysis was required, nor was data qualification necessary.

Selected surface water samples reported in this package were reanalyzed for dissolved aluminum, dissolved arsenic, and dissolved cadmium without dilution in order to achieve lower reporting limits to meet project objectives. The results for the re-analysis were reported in three data packages: WATRAS1, WATRAS2, and WATRAS3. Each package was reviewed in accordance with SOP 12.1. The results of the review are reported in separate data review narrative summaries. In all cases, the results for the re-analysis have been annotated to indicate which results were selected for reporting. The associated Data Validation Report for each sampling event affected contains further details.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	One of the vials sent for the TOC analysis of sample MW-9A-T01N-GRW was accidentally broken at the laboratory. As there were five remaining vials for sample MW-9A-T01N-GRW, the broken vial did not affect the completeness of the sampling program.
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Blanks	No	Several analytes were detected in the volatile and semivolatile blanks. Some tentatively identified compounds were reported as present as well. Table 1.2a summarizes the volatile and semivolatile blank detections and resultant data qualifications. Aluminum, antimony, beryllium, copper, iron, magnesium, manganese, nickel, and potassium were detected in various blanks. Table 1.2b summarizes the blank detections and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS MW-9A-T01N-GRW MW-9A-D01N-GRW • LD MW-9A-T01N-GRW MW-9A-D01N-GRW	No	The matrix spike (MS) percent recovery for some analytes was out of limits in sample MW-9A-T01N-GRW. Table 1.3 summarizes these MS results. The MS results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent samples were qualified on the basis of MS results per SOP 12.1.
Method QC • Surrogates • Serial Dilution MW-9A-T01N-GRW MW-9A-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance RB01T/D-GRW	Yes	The surrogate recovery for the explosive analysis was low in sample FB01T-GRW. The recovery of 1,2-dinitrobenzene was 83%. This recovery is outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Because the surrogate recovery is lower than the acceptance limit but greater than 10%, all explosive results for sample FB01T-GRW were qualified as estimated (UJ). The serial dilution analyses were conducted on samples MW-9A-T01N-GRW, and MW-9A-D01N-GRW, pH class C. For both samples the percent difference between the original result and result for the diluted sample for calcium did not satisfy the ≤10% criterion and the calcium results for these two samples were qualified as estimated. Table 1.4 summarizes these results. The serial dilution results for each sampling event will be evaluated collectively and any resultant/additional data qualification will be summarized in the overall assessment. Parent samples were qualified on the basis of serial dilution results per SOP 12.1. For sample MW-9A-T01N-GRW the partial analysis of orthophosphate exceeded that of the total analysis of phosphorus did not meet acceptance criteria. Table 1.5 summarizes these results and the data qualifications. For sample RB01T/D-GRW, the anion/cation balance was 18.3%, outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary for AC Balance.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) MW-20-T01D-GRW MW-20-D01D-GRW • Rinsate Blank (RB) RB01T-GRW RB01D-GRW • Field Blank (FB) FB01T-GRW • Trip Blank (TB) TB156-GRW TB157-GRW • Other (e.g., splits)	No	There were a few detections in the various field quality control blanks (RBs and FB). These are summarized in Tables 1.6 and 1.7. The RB and FB results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	No	Table 1.8 and 1.9 summarizes the continuing calibration verification detection and the resultant data qualifications.
Laboratory Control Sample Results	No	The LCS percent recovery performed on 3/11/03 for ammonia-nitrogen was outside acceptance criteria at a value of 76.2%. However, the LCS duplicate was within the acceptance criteria at a value of 87.1%. In addition, LCS and LCS duplicate for ammonia-nitrogen performed on 3/7/03 and 3/13/03 were all within acceptance criteria. Therefore, no qualification was performed. Refer to laboratory case narrative summary for explosives LCS analytes outside QC limits.
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)
MW-9A-T01N-GRW	0.73 J	0.005 UJ	0.12 J
MW-1-T01N-GRW	---	0.005 UJ	0.010 UJ
MMW-44B-T01N-GRW	1.3 J	0.005 UJ	0.010 UJ
MW-17-T01N-GRW	0.4 UJ	0.005 UJ	0.010 UJ
MMW-31B-T01N-GRW	0.4 UJ	0.005 UJ	0.010 UJ
MW-20-T01N-GRW	1.9 J	0.005 UJ	0.25 J
MW-20-T01D-GRW	2.0 J	0.005 UJ	0.023 J

Table 1.2a
Volatile and Semi-volatile Organic Compounds Blank Detections Resulting in Data Qualification

Analyte	MB (µg/l)	IDL	Samples Qualified	Qualification Code
1,2,4-Trichlorobenzene	1	10	MMW-44B-T01N-GRW, MW-17-T01N-GRW	NJ ID-I
4-Hydroxy-4-Methyl 2 Pentanone[1, 2]	8	10	FB01T-GRW, MMW-44BT01N-GRW, MW-17-T01N-GRW	Reject identification of TIC
UNKNOWN[1]	4	10	MMW-44BT01N-GRW, MW-17-T01N-GRW	NJ identification of TIC

CCBx-Continuing Calibration Blank RL= Reporting Limit

[1] Compound is a tentatively identified compound (TIC). TICs in method blanks are not considered to be reportable as TICs for samples.

[2] Compound is a suspected aldol condensation product of acetone

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2b
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	CCB7 (µg/l)	CCB8 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P) DF=10	39.1									14.2	MMW-42B-T01N-GRW, MMW-44B-T01N-GRW, MW-20-T01N-GRW, MW-20-T01D-GRW, MW-24-T01N-GRW	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	CCB7 (µg/l)	CCB8 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (P) DF=1				0.9	1.0	0.9	0.8	0.9		0.3	MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, MW-1-T01N-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW	U CCB-I
Beryllium (P) DF=1				0.2						0.2	MMW-42B-T01N-GRW, MMW-42B-D01N-GRW, MW-20-T01N-GRW, MW-20-D01N-GRW, MW-20-T01D-GRW, MW-20-D01D-GRW	U CCB-I
Copper (P) DF=1		-1.7	-1.9	-3.8						1.7	All samples in this package	UJ CCB-L
Iron (P) DF=10	66.4	-53.1								48.9	MW-17-T01N-GRW, MW-17-D01N-GRW, MW-1-D01N-GRW, MW-20-T01N-GRW, MW-20-D01N-GRW, MW-20-T01D-GRW, MW-20-D01D-GRW, MW-24-T01N-GRW, MW-24-D01N-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW, RB01T-GRW, RB01D-GRW	UJ CCB-L
Manganese (P) DF=10	5.4	2.1	-0.8						-0.64	0.5	MW-17-T01N-GRW, MW-17-D01N-GRW, MW-20-T01N-GRW, MW-20-T01D-GRW, MW-20-D01D-GRW MW-1-T01N-GRW, MW-1-D01N-GRW, MW-20-D01N-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW, RB01T-GRW, RB01D-GRW	U CCB-I UJ/J MB-L UJ/J CCB-L
Nickel (P) DF=10	2.6		1.7							1.5	MMW-42B-T01N-GRW, MMW-42B-D01N-GRW, MW-20-T01N-GRW, MW-20-D01N-GRW, MW-20-T01D-GRW, MW-24-T01N-GRW, MW-24-D01N-GRW	U CCB-I
Potassium (P) DF=1	486.2	728.4	879.3	1088					233.5	201.8 314.1	MMW-31B-T01N-GRW, MMW-31B-D01N-GRW, MMW-44B-D01N-GRW, MW-17-T01N-GRW, MW-17-D01N-GRW, MW-1-T01N-GRW, MW-1-D01N-GRW, MW-20-T01N-GRW, MW-20-D01N-GRW, MW-20-T01D-GRW, MW-20-D01D-GRW, MW-24-T01N-GRW, MW-24-D01N-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW, RB01T-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

1 Compound is a tentatively identified compound (TIC). TICs in method blanks are not considered to be reportable as TICs for samples.

2 Compound is a suspected aldol condensation product of acetone

Table 1.3
Matrix Spike Recovery Not Meeting Criteria for Sulfate and Metals

Sample/Analytes	Matrix Spike Recovery	Acceptance Limits	Action
MW-9A-T01N-GRW			
Bicarbonate Alkalinity	0.0%	75-125%	Qualify parent sample J MS-L
Phosphorus	20.8%		Qualify parent sample J MS-L
TOC	160%		Qualify parent sample J MS-H

Table 1.4
Serial Dilution Results Not Meeting Criteria

Sample/Analyte	%Difference	Action
MW-9A-T01N-GRW • Calcium	30.0%	Qualify parent sample J SD-H
MW-9A-D01N-GRW • Calcium	26.5%	Qualify parent sample J SD-H

Table 1.5
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Absolute Difference	RL	Action
MW-9A-T01N-GRW • Orthophosphate vs. Phosphorus	0.103	0.010	Results for these analytes in the MW-9A-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.

Table 1.6
Positive Results for Rinsate Blanks

Analyte	RB01T-GRW (µg/l)	RB01D-GRW (µg/l)
TDS	46	---
Chloride	0.51	---
Bicarbonate Alkalinity	2.8	---
Total Alkalinity	2.8	---
Ammonia	0.052	---
Phosphorus	0.020	---

Table 1.7
Positive Results for Field Blanks

Analyte	FB03T-SOL (µg/l)
Bis (2-ethylhexyl) phthalate*	1

* a recognized common laboratory contaminant

Table 1.8
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

SVOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
3/11/03 (1334)	Hexachlorocyclopentadiene di-n-octylphthalate	31.5% 25.4%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I

Table 1.9
Continuing Calibration Verification Resulting in Qualification

Analyte	CCV4 %R	CCV7 %R	Samples Qualified	Qualification Codes
Manganese (P)	89.3	---	MMW-42B-T01N-GRW MMW-42B-D01N-GRW MW-24-T01N-GRW MW-24-D01N-GRW MW-20-T01N-GRW MW-20-D01N-GRW MW-20-T01D-GRW MW-20-D01D-GRW MMW-31B-T01N-GRW MMW-31B-D01N-GRW	J CCV-L
Potassium (P)	113.2	---	MMW-42B-T01N-GRW MMW-42B-D01N-GRW MW-24-T01N-GRW MW-24-D01N-GRW MMW-31B-T01N-GRW MMW-31B-D01N-GRW MW-20-T01N-GRW MW-20-D01N-GRW MW-20-T01D-GRW MW-20-D01D-GRW	J CCV-H
Selenium (MS)	---	87.6	MW-24-D01N-GRW MMW-31B-T01N-GRW MMW-31B-D01N-GRW MW-20-T01N-GRW MW-20-D01N-GRW MW-20-T01D-GRW MW-20-D01D-GRW	J/UJ CCV-L

P=ICP MS=ICP-MS CCVx-Continuing Calibration Verification

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT053A Sampling Event: March 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 05/05/03

Peer Reviewer: Stacey Coker Date Completed: 0/28/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Metals	Inorganics	VOC	SVOC	Explosives
MMW-17A-T01N-GRW	SA	518470		W	X	X			
MMW-17A-D01N-GRW	SA	518471		W	X				
MMW-47A-T01N-GRW	SA	518472	MMW47AT1NGRW and MMW47AT01NGRW and MMW47AT01DGR	W	X	X	X	X	X
MMW-47A-D01N-GRW	SA	518473		W	X				
MMW-47A-T01D-GRW	SA	518474	MMW47AT1DGRW and MMW47AT01DGRW and MMW47AT01DGR	W	X	X	X	X	X
MMW-47A-D01D-GRW	SA	518475		W	X				
MMW-17B-T01N-GRW	SA	518476		W	X	X			
TB160-GRW	TB	518477		W			X		
MMW-17B-D01N-GRW	SA	518478		W	X				
MMW-45A-T01N-GRW	SA	518479		W	X	X			
MMW-45A-D01N-GRW	SA	518480		W	X				
MMW-48A-T01N-GRW	SA	518481	MMW48AT1N and MMW48AT01 and MMW48AT01	W	X	X	X	X	X
MMW-48A-D01N-GRW	SA	518482		W	X				
TB162-GRW	TB	518483		W			X		
MMW-45B-T01N-GRW	SA	518484		W	X	X		X	X
MMW-45B-D01N-GRW	SA	518517		W	X				

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

It is noted that the Total Organic Carbon (TOC) analysis by method 9060 was subcontracted to STL's Austin, Texas facility, due to a malfunction of the laboratory's TOC instrument, which could not be corrected within the analytical holding time. This does not affect the quality or usability of the data.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

The laboratory case narrative noted the nitroaromatic analysis of the blank spike sample with this delivery group yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded a percent recovery of 10%. This sample was re-extracted outside the prescribed holding time yielding a blank spike recovery for PYX that was below the default control criteria, but comparable to typical recoveries. The laboratory had not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recovery of 50% was below the lower limit but >10%, the PYX results for all samples have been qualified as estimated (J/UJ), with a low bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, arsenics, iron, molybdenum, and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS MMW-48A-T01N-GRW MMW-48A-D01N-GRW • LD MMW-48A-T01N-GRW MMW-48A-D01N-GRW	No	The matrix spike (MS) percent recovery for some analytes was out of limits in samples MW-48A-T01N-GRW and MMW-48A-D01N-GRW. Table 1.3 summarizes these MS results. The MS results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Method QC • Surrogates • Serial Dilution MMW-48A-T01N-GRW MMW-48A-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analyses on samples MMW-48A-T01N-GRW and MMW-48A-D01N-GRW, both pH class B, were applicable for 0 out of 24 analytes. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-45A-T01N-GRW, MMW-45A-D01N-GRW, MMW-45B-T01N-GRW, and MMW-45B-D01N-GRW. Therefore, the molybdenum results for these samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample MMW-47A-T01N/D01N-GRW, the anion/cation (A/C) balance was 32%, outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values. Therefore no qualification of these sample results was considered necessary for A/C balance.
Field QC • Field Duplicate (FD) MMW-47A-T01D-GRW MMW-47A-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) TB160-GRW TB162-GRW • Other (e.g., splits)	No	The field duplicate results satisfied the QAPP evaluation criteria. The field QC sample results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	The LCS results for explosives were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial calibration for VOCs and SVOCs were all within their percent recoveries, therefore no qualification was necessary. Table 1.4 summarizes continuing calibration detections and the resultant data qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)
MMW-17A-T01N-GRW	---	---	0.01 UJ
MMW-47A-T01N-GRW	---	---	0.01 UJ
MMW-47A-T01D-GRW	---	---	0.01 UJ
MMW-17B-T01N-GRW	---	0.005 UJ	0.011 J
MMW-45A-T01N-GRW	0.41 J	0.005 UJ	0.016 J
MMW-48A-T01N-GRW	0.40 UJ	---	0.061 J
MMW-45B-T01N-GRW	0.40 UJ	0.005 UJ	0.031 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=100			23.3			22.6	MMW-17B-T01N -GRW, MMW-17B-D01N-GRW	U CCB-I
Antimony (P) DF=10		-2.8				2.3	MMW-17A-T01N-GRW, MMW-17A-D01N-GRW, MMW-57A-T01N-GRW, MMW-47A-D01N-GRW, MMW-47A-T01D-GRW, MMW-471-D01D-GRW, MMW-17B-T01N-GRW, MMW-17B-D01N-GRW, MMW-45A-T01N-GRW, MMW-45A-D01N-GRW, MMW-48A-T01N-GRW, MMW-48A-D01N-GRW	UJ CCB-L
Iron (P) DF=100	30.9	37.7	29.6	30.3		26.6	MMW-17A-T01N-GRW	U CCB-I
Molybdenum (P) DF=10		1.3		1.4	1.128	1.1	MMW-17A-T01N-GRW, MMW-17A-D01N-GRW, MMW-45A-D01N-GRW, MMW-47A-D01N-GRW, MMW-48A-T01N-GRW, MMW-48A-D01N-GRW	U CCB-I U MB-I
Sodium (P) DF=100					393.6	365.6	MMW-45B-D01N-GRW, MMW-47A-T01N-GRW, MMW-47A-D01N-GRW, MMW-48A-T01N-GRW, MMW-48A-D01N-GRW	U MB-I
4-Hydroxy-4-Methyl 2 Pentanone[1, 2]					8	10	MMW-47A-T01D-GRW, MMW-47A-T01N-GRW, MMW-48A-T01N-GRW	Reject identification of TIC
UNKNOWN					4	10	MMW-48A-T01N-GRW	NJ for all unknown TICS

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

[1] Compound is a tentatively identified compound (TIC). TICs in method blanks are not considered to be reportable as TICs for samples.

[2] Compound is a suspected aldol condensation product of acetone

Table 1.3
Matrix Spike, Matrix Spike Duplicate, and Post Digestion Spike Recovery Not Meeting Criteria

Sample/Analytes	Matrix Spike Recovery	Matrix Spike Duplicate Recovery	Post digestion Spike Recovery	Acceptance Limits	Action
MMW-48A-T01N-GRW					
Phosphorus	52%	NA	NA	75-125%	Qualify parent sample J MS-L
Selenium	72%	NA	NA		Qualify parent sample UJ MS-L
Cyanide	73%	NA	NA		Qualify parent sample UJ MS-L
RDX	138%	142%	NA	81-116%	Parent sample nondetect, no qualification
PETN	74%	70%	NA	75-110%	Qualify parent sample UJ MS-L
PYX	62%	55%	NA	70-130%	Qualify parent sample UJ MS-L
MMW-48A-D01N-GRW					
Arsenic	128%	NA	NA	75-125%	Parent sample ND, no qualification

NA = Not appropriate

ND = Nondetect

RL = Reporting limit (generally the IDL adjusted for dilution)

IDL = Instrument detection limit

Table 1.4
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
3/7/03 (0834)	Dichlorodifluoromethane Acetone 2-Hexanone Bromoform 1, 4-Dichlorobenzene	-31.6% 41.5% 28.3% -33.7% -27.4%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I
3/7/03 (2139)	Acetone 2-Hexanone	-27.2% -26.6%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
3/11/03 (1334)	Hexachlorocyclopentadiene Di-n-octylphthalate	31.5% 25.4%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT054A Sampling Event: March 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 04/22/03

Peer Reviewer: Stacey Coker Date Completed: 04/22/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Metals	Inorganics	VOC	SVOC	Explosives
GWW-1-T01N-GRW	SA	518564		W	X	X			
GWW-1-D01N-GRW	SA	518565		W	X				
GWW-2-T01N-GRW	SA	518566		W	X	X			
GWW-2-D01N-GRW	SA	518567		W	X				
MWW-29A-T01N-GRW	SA	518568	MMW29AT01NGR	W	X	X			X
MWW-29A-D01N-GRW	SA	518569		W	X				
MMW-33A-T01N-GRW	SA	518570	MMW33AT01NGR	W	X	X			X
MMW-33A-D01N-GRW	SA	518571		W	X				
GWW-3-T01N-GRW	SA	518572		W	X	X			
GWW-3-D01N-GRW	SA	518573		W	X				
MMW-10A-T01N-GRW	SA	518574	MMW10AT01NGR	W	X	X			X
MMW-10A-D01N-GRW	SA	518575		W	X				
MMW-44A-T01N-GRW	SA	518576	MMW44AT1NGRW and MMW44AT01NGRW and MMW44AT01NGR	W	X	X	X		X
MMW-44A-D01N-GRW	SA	518577		W	X				
RB01T-GRW	RB	518578		W	X	X	X	X	X
TB154-GRW	TB	518579		W			X		

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

2 Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

It is noted that the Total Organic Carbon (TOC) analysis by method 9060 was subcontracted to STL's Austin, Texas facility, due to a malfunction of the laboratory's TOC instrument, which could not be corrected within the analytical holding time. This does not affect the quality or usability of the data.

During the TKN analyses of the samples in this delivery group, the high-level blank spike analysis (LCS-1) exhibited a percent recovery in excess of control limits. No qualification of data was necessary as all results for TKN analyses were reported as nondetects.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW048, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	One of the vials sent for the VOC analysis of trip blank TB154-GRW had an air bubble. The laboratory attached a note to the vial so that the analyst would use the second vial that did not have an air bubble.
Holding Times	No	The 48-hour holding time was exceeded by less than 24 hours for nitrate as N, nitrite as N, orthophosphate, and the 7 day holding time was exceeded by less than 2 days for TDS. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Chloride, aluminum, arsenic, boron, and molybdenum were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Not Applicable	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution GWW-1-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The surrogate recovery for the explosive analysis was low in samples MMW-33A-T01N-GRW and MMW-44A-T01N-GRW. The recovery of 1,2-dinitrobenzene was 82% and 83%, respectively. These recoveries were outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Because the surrogate recovery is lower than the acceptance limit but greater than 10%, all explosive results for both samples were qualified as estimated (UJ). Although serial dilutions tests were conducted for each analyte, the native sample concentration were <50x IDLs. Therefore the serial dilution results are not considered appropriate for assessing interferences. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-44A-T01N-GRW and MMW-44A-D01N-GRW. Therefore, the molybdenum results for these samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample MMW-29A-T01N-GRW the partial analysis of orthophosphate exceeded that of the total analysis of phosphorus did not meet acceptance criteria. Table 1.3 summarizes these results and the data qualifications.
Field QC • Field Duplicate • Rinsate Blank RB01T-GRW • Field Blank • Trip Blank TB154-GRW • Other (e.g., splits)	No	There were a few detections in the rinsate blank (RB). These are summarized in Table 1.4. The RB results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	The LCS results for explosives were reviewed as summarized in the case narrative section.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Not Applicable	Package reviewed for sample-specific parameters only.
Initial/Continuing Calibration Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Laboratory Control Sample Results	Reviewed based on case narrative	Please see summary in the case narrative comment section above.
Compound Identification	Not Applicable	Package reviewed for sample-specific parameters only.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Quantification	Not Applicable	Package reviewed for sample-specific parameters only.
Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Not Applicable	Package reviewed for sample-specific parameters only.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)
MMW-29A-T01N-GRW	4.6 J	0.005 UJ	0.46 J	---
MMW-33A-T01N-GRW	3.8 J	0.005 UJ	0.011 J	---
MMW-44A-T01N-GRW	0.7 J	---	---	4330 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL or RL	Samples Qualified	Qualification Code
Chloride DF=2 DF=10					0.28	0.2	NONE	Data qualification was not necessary, as all chloride results were sufficiently higher than 5x the blank concentration.
Aluminum (P) DF=10	28.8	32.7				22.6	NONE	Data qualification was not necessary, as all aluminum results were either nondetect or the sample results were sufficiently higher than 5x the blank concentration.
Arsenic (P) DF=1	5.0	2.4		3.9		2.3	GWW-1-D01N-GRW, GWW-2-T01N-GRW, GWW-3-T01N-GRW, GWW-3-D01N-GRW, MMW-10A-D01N-GRW, MMW-29A-D01N-GRW, MMW-33A-T01N-GRW, MMW-44A-D01N-GRW	U CCB-I
Boron (P) DF=1	4.2	2.9		3.6	3.403	2.7	MMW-33A-T01N-GRW	U CCB-I U MB-I
Molybdenum (P) DF=10	1.4		-1.4			1.1	All samples in this package.	UJ CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Absolute Difference	RL	Action
MMW-29A-T01N-GRW • Orthophosphate Vs. Phosphorus	0.441	0.010	Results for these analytes in the MMW-29A-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.

Table 1.4
Positive Results for Rinsate Blanks

Analyte	RB01T-GRW (µg/l)
TDS	20
Chloride	0.75
Nitrate	0.42
Bicarbonate Alkalinity	2.5
Total Alkalinity	2.5
Ammonia	0.048
TOC	1.5
Antimony	30

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT055C Sampling Event: March 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 04/23/03

Peer Reviewer: Stacey Coker Date Completed: 04/28/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	BOD	COD
TB164-GRW	RB	518601		W			X				
MMW-28A-T01N-GRW	SA	518602	MMW-28A-GRW MMW28AT01NGRW	W	X	X	X	X	X		
MMW-28A-D01N-GRW	SA	518603		W	X						
CC1B-T01N-GRW	SA	518606		W	X	X					
CC1B-D01N-GRW	SA	518605		W	X						
CC2B-T01N-GRW	SA	518604		W	X	X					
CC2B-D01N-GRW	SA	518607		W	X						
RRDSSPG13-T01N-SFW	SA	518608		W	X	X				X	X
RRDSSPG13-D01N-SFW	SA	518609		W	X						
RRUSSPRING13-T01N-SFW	SA	518707	RRUSSPRING13-T01N-SF	W	X	X				X	X
RRUSSPRING13-D01N-SFW	SA	518708	RRUSSPRING13-D01N-SF	W	X						
RB01T-SFW	RB	518709		W	X	X				X	X
RB01D-SFW	RB	518710		W	X						
RRDSSPRING39-T01N-SFW	SA	518711	RRSSPRING39-T01N-SF	W	X	X				X	X
RRDSSPRING39-D01N-SFW	SA	518712	RRSSPRING39-D01N-SF	W	X						
RRUSSPRING39-T01N-SFW	SA	518713	RRUSSPRING39-T01N-SF	W	X	X				X	X
RRUSSPRING39-D01N-SFW	SA	518714	RRUSSPRING39-D01N-SF	W	X						
RRDSSPRING39-T01D-SFW	SA	518715	RRDSSPRING39-T01D-SF	W	X	X				X	X
RRDSSPRING39-D01D-SFW	SA	518716	RRDSSPRING39-D01D-SF	W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

It is noted that the Total Organic Carbon (TOC) analysis by method 9060 was subcontracted to STL's Austin, Texas facility, due to a malfunction of the laboratory's TOC instrument, which could not be corrected within the analytical holding time. This does not affect the quality or usability of the data.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile organic holding blank was carried through the sample storage period and analyzed with the sample reported in this package. The results for this blank, HBW049, were all nondetect thereby indicating the occurrence of potential cross contamination during sample storage was unlikely.

The laboratory noted manual integration was employed in deriving results for the semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified on the quantitation reports. Included in the data package were the extracted ion current profiles.

The laboratory case narrative noted the nitroaromatic analysis of the blank spike sample (i.e. the laboratory control sample) with this delivery group yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded a percent recovery that was much lower than expected, at 10%. This sample was re-extracted outside the prescribed holding time, yielding a PYX blank spike recovery of 50%, which is outside the default control criterion of 70-130%, but comparable to typical recoveries. Since the LCS recovery of 50% was less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (J/UJ), with a low bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Through evaluation of total vs. partial analyses, it was determined that the "T01N" containers for samples CC1B and CC2B were revised during log-in. The laboratory confirmed that this error did occur at log-in. As such, the laboratory provided a revised case narrative and data package.
Holding Times	No	Several nitrate, nitrite, orthophosphate, and BOD5 samples were run several hours beyond the 48 hour holding time. Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Blanks	No	Chloride was detected in the inorganic method blank laboratory sample BLKIC0306A run on 03/06/03 at 0.28 mg/L, which marginally exceeded the laboratory's reporting limit of 0.20 mg/L. The chloride results for sample RB01T-SFW was qualified as nondetect with an indeterminate direction of bias, as the chloride concentration of 0.51 mg/L was less than five times the equivalent blank concentration. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. Two tentatively identified compounds were reported as present in SBLKV5. The identifications of 4-Hydroxy-4-Methyl-2-Pentanone and Octahydro- Pentalene in the samples were rejected. TICs in method blanks are not considered to be reportable as TICs for samples.
Matrix QC • MS/MSD RRDSSPG13-T01N-SFW RRDSSPG13-D01N-SFW • PDS • LD RRDSSPG13-T01N-SFW RRDSSPG13-D01N-SFW	No	The matrix spike analyses on sample RRDSSPG13-T01N-SFW reported several analytes recovered outside of the acceptance range of 75-125% for inorganics. All matrix spike recoveries for metals were recovered within the acceptance range of 75-125%, with the exception of iron, which was recovered at 153.8%. Post digestion spike samples were run for metal samples RRDSSPG13-T01N-SFW and RRDSSPG13- D01N-SFW, despite the fact that all except for iron yielded acceptable recoveries. The post digest spike recovery of cyanide for sample RRDSSPG13-T01N-SFW was 0.0%. No qualification of data was necessary on account of post digest recovery due to acceptable recovery of cyanide matrix recovery on sample RRDSSPG13-T01N-SFW. Table 1.3 summarizes these analytes along with the associated percent recoveries and the qualification codes assigned to the parent samples. The matrix quality control results for the March 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) RRDSSPG13-T01N-SFWL RRDSSPG13-D01N-SFWL • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery for the explosive analysis was low in blank sample EBLKG5. The recovery of 1,2-dinitrobenzene was 85%. This recovery is outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. No qualification of data was necessary due to the fact that this was a blank sample and all results were nondetect. The serial dilution analyses on samples RRDSSPG13-T01N-SFW and RRDSSPG13-D01N-SFW were not applicable for all 24 metal analytes. It was therefore not necessary to qualify any results on the basis of serial dilutions. The molybdenum concentration of 7.2 µg/L in the filtrate (dissolved) sample RRDSSPG13-D01N-GRW was greater than the molybdenum concentration of 4.6 µg/L in the corresponding total metals sample, RRDSSPG13-T01N-GRW. Due to the fact that neither value was greater than 5x the RL (1.1 g/L), the absolute difference between the two results was compared to an evaluation criterion of 2x the RL. Accordingly, the molybdenum results for both samples were qualified as estimated (UJ) with an indeterminate direction of bias. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion with the exception of the rinsate blank sample RB01T/D-SFW, which reported an anion/cation percent difference of 48.63%. The concentrations in this sample was low enough that reporting limits controlled the calculations. The balance was therefore not an appropriate measure of accuracy. No qualification was considered necessary. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank RB01D-SFW RB01T-SFW • Field Blank • Trip Blank TB164-GRW	N/A	No analytes were detected in TB164-GWR or RB01D-SFW. Table 1.4 summarizes detects for the remaining rinsate blank. The Field QC results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1. Additionally, a revised package was submitted for the correction for CC1B and CC2B total metals results which were initially interchanged due to a log-in error.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration • Metals: Continuing Calibration Verification Table 1.5 summarize the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. Selenium was qualified in all samples as qualified (J/UJ) with a low bias direction and reason code (CCV).

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho P	BOD_5
MMW-28A-T01N-GRW	0.70 J	0.0050 UJ	0.020 J	---
RRDSSPG13-T01N-GRW	---	---	---	1.6 UJ
RRUSSPRING13-T01N-SFW	0.73 J	0.0050 UJ	0.010 UJ	1.6 UJ
RB01T-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	1.6 UJ
RRDSSPRING39-T01N-SFW	---	---	---	1.6 UJ
RRDSSPRING39-T01D-SFW	---	---	---	1.6 UJ

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	---	-19.7	-14.2	-14.8	-90.8	---	14.2	All samples with the **exception** of: RRDSSPG13-T01N-SFW RRDSSPRING39-T01N-SFW RRUSSPRING13-T01N-SFW	J CCB-L Or UJ CCB-L
Antimony (MS)	---	---	0.4	0.4	---	---	0.3	RB01D-SFW	U CCB-I
Barium (P)	---	---	---	---	---	5.253	4.8	CC2B-T01N-GRW CCB2-D01N-GRW MMW-28A-D01N-GRW MMW-28A-T01N-GRW	U MB-I
Beryllium (P)	---	---	---	---	0.7	---	0.2	None of the Be samples were associated with CCB5	---
Calcium (P)	---	---	---	---	---	413.400	305.2	*None	---
Copper (P)	---	-2.8	-3.1	-3.1	-6.8	---	1.7	All samples with the **exception** of: RRDSSPG13-T01N-SFW RRUSSPRING13-T01N-SFW	J CCB-L or UJ CCB-L
Iron (P)	51.9	---	---	---	---	94.070	29.9	CCB2-T01N-GRW	U MB, CCB-I
Molybdenum (P)	2.9	1.1	---	1.6	---	2.536	1.1	All samples	U MB, CCB-I OR U MB-I
Potassium (P)	---	---	710.8	627.2	474.2	---	327.4	*None	---
Zinc (P)	---	---	---	---	---	2.815	2.5	CC1B-D01N-GRW CC1B-T01N-GRW CC2B-D01N-GRW CC2B-T01N-GRW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

*None of the Ca or K samples were qualified, as they were either nondetect or greater than 5x the blank concentration.

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Comment	Action
RRDSSPG-13-T01N-SFW					
Bicarbonate Alkalinity	2.0	---	75-125%	Positive effects qualified as estimated "J"	J MS-L for parent sample
Ammonia-Nitrogen	69.8	---		Positive effects qualified as estimated "J"	J MS-L for parent sample
Sulfate	71.0	---			
Iron	153.8	121.6		Nondetect results are considered acceptable for use without qualification	No qualification
Cyanide	81.6	0.0		Matrix spike recovery was within acceptance range	No qualification

NA = Not appropriate

ND = Nondetect

RL = Reporting limit (generally the IDL adjusted for dilution)

IDL = Instrument detection limit

Table 1.4
Field Quality Control Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB01T-SFW	03/05/03	Bicarbonate Alkalinity Total Alkalinity Ammonia-Nitrogen	2.7 2.7 0.060	1.0 1.0 0.040

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.5
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date (Time)	Analyte	% RSD >25%	Samples Qualified	Qualification and Qualification Codes
VOC	03/07/03 (0834)	Dichlorodifluoromethane	-31.6	MMW-28A-T01N-GRW TB164-GRW	UJ CCAL-I
		Acetone	41.5		
		Bromoform	-33.7		
SVOC	03/11/03 (1334)	Hexachlorocyclopentadiene	31.5	MMW-28A-T01N-GRW	UJ CCAL-I
		Di-n-octylphthalate	25.4		

CAL = Initial Calibration RSD = Percent relative standard deviation

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT056A Sampling Event: March 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 04/15/03

Peer Reviewer: Stacey Coker Date Completed: 04/15/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
SPRING13PUMP-T01N-GRW	SA	518665	SPRING13PUMP-T01N-GR	W	X	X					
SPRING13PUMP-D01N-GRW	SA	518666	SPRING13PUMP-D01N-G	W	X						
SPRING39PUMP-T01N-GRW	SA	518667	SPRING39PUMP-T01N-GR	W	X	X					
SPRING39PUMP-D01N-GRW	SA	518668	SPRING39PUMP-D01N-G	W	X						
MMW-49A-T01N-GRW	SA	518669		W	X	X					
MMW-49A-D01N-GRW	SA	518670		W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

2 Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

It is noted that the Total Organic Carbon (TOC) analysis by method 9060 was subcontracted to STL's Austin, Texas facility, due to a malfunction of the laboratory's TOC instrument, which could not be corrected within the analytical holding time. This does not affect the quality or usability of the data.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks	No	Several metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (A) SPRING13PUMP-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis on sample SPRING13PUMP-T01N-GRW was not applicable for 22 out of 24 metal analytes. The two metal analytes, for which the dilution was applicable, did not exhibit percent differences between the initial sample result and the 5-fold serial dilution result that were greater than 10%. (Aluminum obtained a 5.4% difference, and manganese a 1.8% difference). It was therefore not necessary to qualify any data on the basis of serial dilution. The zinc concentration of 4580 g/L in the dissolved metals sample SPRING13PUMP-D01N-GRW was greater than its corresponding zinc concentration of 3340 g/L in the total metals sample SPRING13PUMP-T01N-GRW. Due to the fact that both partial and total concentrations were in excess of 5x the RL, 390 g/L, (adjusted for a dilution factor of 100), the percent difference between the two concentrations was compared to an evaluation criterion of ±30%. The zinc concentration of the dissolved metals sample was 37% greater than that in the total metals sample. Consequently, the zinc results for these two samples were qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion and subsequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	The Field QC results for the March 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Not Applicable	Package reviewed for sample-specific parameters only.
Initial/Continuing Calibration Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Laboratory Control Sample Results	Not Applicable	Package reviewed for sample-specific parameters only.
Compound Identification	Not Applicable	Package reviewed for sample-specific parameters only.
Quantification	Not Applicable	Package reviewed for sample-specific parameters only.
Verification	Not Applicable	Package reviewed for sample-specific parameters only.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Not Applicable	Package reviewed for sample-specific parameters only.

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P)	---	---	---	-0.2	---	---	0.2	*NONE	---
Molybdenum (P)	1.5	---	1.5	---	---	---	1.1	*NONE	---
Sodium (P)	---	---	433.6	---	---	---	327.4	MMW-49A-D01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

*Data qualification was not necessary, as all of the beryllium results reported were not relevant to the continuing blank detection event CCB4, and all molybdenum results were nondetect.

MOLYCORP RI/FS REANALYSIS
DATA REVIEW SUMMARY

Data Package Number: WATRAF2

Sampling Event: Re-analysis February, March April 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 07/08/03

Peer Reviewer: Alan Roberts

Date Completed:

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses
					Fluoride
GOATSEEP-T01N-GRWRE 4/4	SA	529085	GOATSEEP-T01N-GRWR	W	X
GWW-1-T01N-GRWRE 2/8	SA	529086		W	X
GWW-1-T01N-GRWRE 3/5	SA	529087		W	X
GWW-1-T01N-GRWRE 4/1	SA	529088		W	X
GWW-2-T01N-GRWRE 2/8	SA	529089		W	X
GWW-2-T01N-GRWRE 3/5	SA	529090		W	X
GWW-2-T01N-GRWRE 4/1	SA	529091		W	X
GWW-3-T01N-GRWRE 2/28	SA	529092		W	X
GWW-3-T01N-GRWRE 3/5	SA	529093		W	X
GWW-3-T01N-GRWRE 4/1	SA	529094		W	X
MMW-45A-T01N-GRWRE 2/6	SA	529095		W	X
MMW-45A-T01N-GRWRE 3/3	SA	529096		W	X
MMW-45B-T01N-GRWRE 2/6	SA	529097		W	X
MMW-45B-T01N-GRWRE 3/3	SA	529098		W	X
MMW-49A-T01N-GRWRE 2/2	SA	529099		W	X
MMW-49A-T01N-GRWRE 2/8	SA	529100		W	X
MMW-49A-T01N-GRWRE 3/5	SA	529101		W	X
MMW-49A-T01N-GRWRE 4/1	SA	529102		W	X
SPRING13PUMP-T01N-GRWRE 2/12	SA	529103	SPRG13PUMP-T01N-GRW	W	X
SPRING13PUMP-T01N-GRWRE 3/5	SA	529104	SPRG13PUMP-T01N-GRW	W	X
SPRING39PUMP-T01N-GRWRE 2/8	SA	529105	SPRG39PUMP-T01N-GRW	W	X
SPRING39PUMP-T01N-GRWRE 3/5	SA	529106	SPRG39PUMP-T01N-GR	W	X
SPRING39PUMP-T01N-GRWRE 4/1	SA	529107	SPRG39PUMP-T01N-GRW	W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The analytical results in this SDG represent re-analyses performed for groundwater samples collected in February, March, and April 2003. These samples were re-analyzed at dilutions for Fluoride based on Aluminum concentrations of the samples at levels interfering with the fluoride analyses. These results supersede the original sample analyses.

The "RE" suffix has been added to the client identifiers to represent re-analyses.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	A 28-day holding time was exceeded for fluoride by 2-4 months, since these samples were re-analysis results. The fluoride results for all samples in this SDG have been qualified as estimated (J/UJ). The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	Yes	
Matrix QC • MS/MSD/PDS GWW-1-T01N-GRWRE • LD GWW-1-T01N-GRWRE	Yes	This package did include site-specific matrix quality control samples. The matrix quality control results for the sampling events will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Not Applicable	This package did not include any method quality control samples.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Not Applicable	This package did not include any site-specific field quality control samples. The field quality control results for the sampling events will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Not Applicable	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Not Applicable	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WATRAS1 Sampling Event: SFW Re-analyses

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 09/10/03

Peer Reviewer: Stacey Coker Date Completed: 09/12/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[(2)]	Matrix	Analysis
					Metals
RR-14-D01N-SFW	SA	537486		W	X
RR-12-D01N-SFW	SA	537487		W	X
RR-13-D01N-SFW	SA	537488		W	X
RR-13-D01D-SFW	FD	537489		W	X
RR-16-D01N-SFW	SA	537490		W	X
RR-11C-D01N-SFW	SA	537491		W	X
RR-10A1-D01N-SFW	SA	537492		W	X
RR-11A1-D01N-SFW	SA	537493		W	X
RR-7-D01N-SFW	SA	537494		W	X
RR-10-D01N-SFW	SA	537495		W	X
RR-DS-SPRING13-D01N-SFW	SA	537496	RR-DSSPRG13-D01N-SFW-020203	W	X
RR-DS-SPRING13-D01D-SFW	FD	537497	RR-DSSPRG13-D01D-SFW	W	X
RR-DS-SPRING39-D01N-SFW	SA	537498	RR-DSSPRG39-D01N-SFW	W	X
RR-US-SPRING13-D01N-SFW	SA	537499	RR-USSPRG13-D01N-SFW	W	X
RR-US-SPRING39A-D01N-SFW	SA	537500	RR-USSPRG39A-D01N-SFW	W	X
RR-US-SPRING39-D01N-SFW	SA	537501	RR-USSPRG39-D01N-SFW	W	X
RR-DS-SPRING13-D01N-SFW	SA	537502	RR-DSSPRG13-D01N-SFW-020903	W	X
RR-DS-SPRING13-D01N-SFW	SA	537503	RRDSSPG13-D01N-SFW	W	X
RR-US-SPRING13-D01N-SFW	SA	537504	RRUSSPRING13-D01N-SFW	W	X
RR-DS-SPRING39-D01D-SFW	FD	537505	RRDSSPRING-D01D-SFW	W	X

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The analytical results presented in the enclosed submittal represent re-analyses performed for surface water samples collected in January, February and March. These samples were re-analyzed for dissolved Aluminum, dissolved Arsenic and dissolved Cadmium with no dilutions to achieve the lowest possible reporting limit.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	N/A	
Holding Times	No	The 180-day holding time for metals was exceeded by numerous days for the majority of samples. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blank Results	No	Aluminum was detected in the initial calibration and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any matrix spike, post-digestion spike or laboratory duplicates. The matrix QC analyses for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Method QC • Surrogates • Serial Dilution RR-14-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	None of the three metals for the serial dilution analysis on sample RR-14-D01N-GRW were applicable, as all initial sample results were not sufficiently larger (x50) than the IDL (adjusted for dilution).
Field QC • Field Duplicates RR-13-D01D-SFW RR-DS-SPRING13-D01D-SFW RR-DS-SPRING39-D01D-SFW • Rinsate Blank • Field Blank • Trip Blank	Yes	The results for all field duplicate pairs satisfied the concentration-dependent evaluation criteria outlined in SOP 12.1. The parent sample for RR-DS-SPRING39-D01D-SFW was not included in the data package, however, it is included in the WATRAS2 package. The field duplicate pairs between the two data packages satisfy the concentration-dependent evaluation criteria outlined in SOP 12.1. This package did not include any rinsate, field or trip blanks. The field duplicate results for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Nondetect Results w/ Elevated RLs?	N/A	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Results Outside Evaluation Criteria and Resultant Data Qualification

Sample	# of Days in Excess of Holding Time	Metals			Qualification
		Aluminum	Arsenic	Cadmium	
RR-14-D01N-SFW	207	73.6 J	0.20 U	0.84 J	UJ HT-I Or J HT-I
RR-12-D01N-SFW	208	112 J	0.20 U	0.59 J	
RR-13-D01N-SFW	208	126 J	0.20 U	0.56 J	
RR-13-D01D-SFW	208	134 J	0.20 U	0.52 J	
RR-16-D01N-SFW	207	73.2 J	0.20 U	0.77 J	
RR-11C-D01N-SFW	208	158 J	0.20 U	0.62 J	
RR-10A1-D01N-SFW	208	83.2 J	0.20 U	0.33 J	
RR-11A1-D01N-SFW	208	68.5 J	0.20 U	0.25 J	
RR-7-D01N-SFW	209	116 J	0.20 U	0.42 J	
RR-10-D01N-SFW	209	110 J	0.20 U	0.34 J	
RR-DS-SPRING13-D01N-SFW	193	279 J	0.20 U	0.84 J	
RR-DS-SPRING13-D01D-SFW	193	232 J	0.20 U	0.91 J	
RR-DS-SPRING39-D01N-SFW	193	110 J	0.20 U	0.60 J	
RR-US-SPRING13-D01N-SFW	193	128 J	0.20 U	0.66 J	
RR-US-SPRING39A-D01N-SFW	193	90.9 J	0.20 U	0.46 J	
RR-US-SPRING39-D01N-SFW	193	78.4 J	0.20 U	0.53 J	
RR-DS-SPRING13-D01N-SFW	186	119 J	0.20 U	0.75 J	

Table 1.2
Blank Detection Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	ICB (µg/l)	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	21.7	23.9	32.4	34.8	37.5	18.3	RR-14-D01N-SFW RR-12-D01N-SFW RR-13-D01N-SFW RR-13-D01D-SFW RR-16-D01N-SFW RR-11C-D01N-SFW RR-10A1-D01N-SFW RR-11A1-D01N-SFW RR-7-D01N-SFW RR-10-D01N-SFW RR-DS-SPRING39-D01N-SFW RR-US-SPRING13-D01N-SFW RR-US-SPRING39A-D01N-SFW RR-US-SPRING39-D01N-SFW RR-DS-SPRING13-D01N-SFW RR-DS-SPRING13-D01N-SFW RR-US-SPRING13-D01N-SFW RR-DS-SPRING39-D01D-SFW	U CCB-I

MB=Method Blank P=ICP ICB – Initial Calibration Blank CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table is limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WATRAS2 Sampling Event: SFW Re-analyses

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 09/11/03

Peer Reviewer: Stacey Coker Date Completed: 09/12/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[(2)]	Matrix	Analysis
					Metals
RR-US-SPRING39-D01N-SFW	SA	537506	RR-US-SPRG39-D01N-SFW	W	X
RR-DS-SPRING39-D01N-SFW	SA	537507	RR-DS-SPRG39-D01N-SFW	W	X
RR-18A-D01N-SFW	SA	537508		W	X
RR-17-D01N-SFW	SA	537509		W	X
RR-18B-D01N-SFW	SA	537510		W	X
RR-16-D01N-SFW	SA	537511		W	X
LR-5-D01N-SFW	SA	537512		W	X
RR-6-D01N-SFW	SA	537513		W	X
RR-6A-D01N-SFW	SA	537514		W	X
RR-7-D01N-SFW	SA	537515		W	X
RR-1-T01N-SFW	SA	537516		W	
RR-1-D01N-SFW	SA	537517		W	X
RR-3-D01N-SFW	SA	537518		W	X
LR-13-D01N-SFW	SA	537519		W	X
LR-16-D01N-SFW	SA	537520		W	X
RR-14-D01N-SFW	SA	537521		W	X
RR-14-D01D-SFW	FD	537522		W	X
RR-11B-D01N-SFW	SA	537523		W	X
LR-11A-D01N-SFW	SA	537524		W	X
ERLIN-D01N-SFW	SA	537525		W	X

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The analytical results presented in the enclosed submittal represent re-analyses performed for surface water samples collected in March. These samples were re-analyzed for dissolved Aluminum, dissolved Arsenic and dissolved Cadmium with no dilutions to achieve the lowest possible reporting limit.

Although the laboratory case narrative stated that RR-1-T01N-SFW (Lab ID #537516) was included in the data package, there were no results for this sample. It is likely that the field ID RR-1-T01N-SFW was included in the case narrative in error as re-analyses were only required for the dissolved fraction and sample RR-1-T01N-SFW was not included on the CLP cover page for the data package.

In an e-mail exchange with Don Dawicki of STL Burlington, he stated that ERLIN-T01N-SFW (Lab ID #537525) was incorrectly labeled in the data package and that the correct ID is ERLIN-D01N-SFW. The data package has been hand-corrected to reflect the correct sample that was analyzed.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	N/A	
Holding Times	Yes	
Laboratory Blank Results	No	Aluminum was detected in the first continuing calibration blank. Table 1.1 summarizes the blank detection and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any matrix spike, post-digestion spike or laboratory duplicates. The matrix QC analyses for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Method QC • Surrogates • Serial Dilution RR-SPRING39-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	None of the three metals for the serial dilution analysis on sample RR-US-SPRING39-D01N-GRW were applicable, as all initial sample results were not sufficiently larger (x50) than the IDL (adjusted for dilution).
Field QC • Field Duplicates RR-14-D01D-SFW • Rinsate Blank • Field Blank • Trip Blank	No	The results for RR-14-D01D-SFW field duplicate did not satisfy the concentration-dependent evaluation criteria outlined in SOP 12.1. Table 1.2 summarizes the field duplicate and the resultant data qualifications. This package did not include any rinsate, field or trip blanks. The field duplicate results for the surface water re-analyses will be assessed collectively and incorporated into the Data Validation Reports for the applicable sampling events. The overall assessments will discuss any resultant data qualification issued.
Nondetect Results w/ Elevated RLs?	N/A	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	Yes	Although the laboratory case narrative stated that RR-1-T01N-SFW (Lab ID #537516) was included in the data package, there were no results for this sample. It is likely that the field ID RR-1-T01N-SFW was included in the case narrative in error as re-analyses were only required for the dissolved fraction and sample RR-1-T01N-SFW was not included on the CLP cover page for the data package.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Blank Detection Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	CCB1 (µg/l)	IDL	Samples Qualified	Qualification code
Aluminum (P)	77.9	63.1	RR-US-SPRING39-D01N-SFW RR-DS-SPRING39-D01N-SFW RR-18A-D01N-SFW RR-17-D01N-SFW RR-18B-D01N-SFW RR-16-D01N-SFW	U CCB-I

P=ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table is limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Field Duplicate Results Outside Evaluation Criteria and Resultant Data Qualification

Sample	Analyte	Concentrations (µg/L)	RL	Evaluation Criterion	Qualification code
RR-14-D01N-SFW RR-14-D01D-SFW	Aluminum	120 323	200	Difference <2xRL	J FD-I

RL= Reporting Limit (the Contract Required Detection Limit [CRDL] is used as the RL for duplicate evaluations.

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE APRIL 2003 QUARTERLY GROUNDWATER AND SURFACE WATER

Prepared for

Molycorp, Inc.
Questa, New Mexico

March 2004

URS Corporation
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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Summary of Reanalyses 2-1

Section 3 Data Review Process 3-1

Section 4 Data Review Commentary 4-1

4.1 Data Review Narratives 4-1
4.2 General Data Quality Issues 4-1
4.2.1 Holding Blanks 4-1
4.2.2 Manual Integration 4-1
4.2.3 Low-Level Detections 4-1
4.2.4 TICS Reported In Blanks 4-1
4.2.5 Dilution Schemes/Non-Detects With Elevated RLs 4-2
4.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 4-2
4.2.7 Non-Valid Matrix Spikes 4-2
4.2.8 Laboratory Performance Review (LPR) Findings 4-2

Section 5 Collective Assessment of Matrix Quality Control Results 5-1

5.1 Matrix Spike Results (Accuracy Evaluation) 5-1
5.1.1 Organic Matrix Spike Results 5-2
5.1.2 Inorganic Matrix Spike Results 5-3
5.1.3 Post-Digestion Spikes 5-6
5.2 Laboratory Duplicate Results (Precision Evaluation) 5-6
5.3 Icp Serial Dilution Results 5-7

Section 6 Collective Assessment of Field Quality Control Results 6-1

6.1 Field Duplicate Agreement 6-1
6.2 Rinsate Blank Results 6-2
6.3 Field Blank Results 6-3
6.4 Trip Blank Results 6-5

Section 7 Overall Data Quality Indicator Assessment 7-1

7.1 Precision 7-1
7.2 Accuracy 7-2
7.3 Completeness 7-3
7.4 Representativeness 7-3
7.5 Comparability 7-3
7.6 Sensitivity 7-3

TABLE OF CONTENTS

List of Tables

Table 1-1	Summary of Groundwater Samples Collected April 2003
Table 1-2	Summary of Surface Water Samples Collected April 2003
Table 5-1	Field Samples Designated for Matrix QC Analysis
Table 5-2	Frequency Requirements for Matrix QC
Table 5-3	Organics Matrix Spike Results
Table 5-4	Inorganics Matrix Spike Results
Table 5-5	Metals Matrix Spike Results
Table 5-6	Inorganic Laboratory Duplicate Results
Table 5-7	ICP Serial Dilution Results
Table 5-8	ICP Serial Dilution Overall Assessment
Table 6-1	Summary of Field Duplicate Samples Collected April 2003
Table 6-2	Field Duplicate Collection Frequency for the April 2003 Sampling Event
Table 6-3	Summary of Rinsate Blank Samples Collected April 2003
Table 6-4	Summary of Rinsate Blank Results and Additional Qualifications
Table 6-5	Summary of Field Blank Samples Collected April 2003
Table 6-6	Summary of Field Blank Results and Additional Qualifications
Table 7-1	Summary of Precision Assessment for April 2003
Table 7-2	Summary of Accuracy Assessment for April 2003

List of Attachments

Attachment 1.1	Data Review Summary for Data Package WAT064A
Attachment 1.2	Data Review Summary for Data Package WAT065C
Attachment 1.3	Data Review Summary for Data Package WAT066C
Attachment 1.4	Data Review Summary for Data Package WAT067C
Attachment 1.5	Data Review Summary for Data Package WAT068C
Attachment 1.6	Data Review Summary for Data Package WAT069C
Attachment 1.7	Data Review Summary for Data Package WAT070C
Attachment 1.8	Data Review Summary for Data Package WAT071C
Attachment 1.9	Data Review Summary for Data Package WAT072C
Attachment 1.10	Data Review Summary for Data Package WAT073C
Attachment 1.11	Data Review Summary for Data Package WAT074C
Attachment 1.12	Data Review Summary for Data Package WAT075C
Attachment 1.13	Data Review Summary for Data Package WAT076A
Attachment 1.14	Data Review Summary for Data Package WAT077C
Attachment 1.15	Data Review Summary for Data Package WAT078C
Attachment 1.16	Data Review Summary for Data Package WAT079C

TABLE OF CONTENTS

Attachment 1.17 Data Review Summary for Data Package WAT080C
Attachment 1.18 Data Review Summary for Data Package WAT081A
Attachment 1.19 Data Review Summary for Data Package WAT082C
Attachment 1.20 Data Review Summary for Data Package WAT083A
Attachment 1.21 Data Review Summary for Data Package WAT084A
Attachment 1.22 Data Review Summary for Data Package WAT085A
Attachment 1.23 Data Review Summary for Data Package WAT086A
Attachment 1.24 Data Review Summary for Data Package WAT088A
Attachment 1.25 Data Review Summary for Data Package WAT089A
Attachment 1.26 Data Review Summary for Data Package WAT090A
Attachment 1.27 Data Review Summary for Data Package WAT091C
Attachment 1.28 Data Review Summary for Data Package WAT092A
Attachment 1.29 Data Review Summary for Data Package WAT093A
Attachment 1.30 Data Review Summary for Data Package WAT099C
Attachment 1.31 Data Review Summary for Data Package WAT103A
Attachment 1.32 Data Review Summary for Data Package WATRAS4

This Data Validation Report (DVR) provides a general overview of the usability of the surface and ground water chemical analytical data obtained during the April 2003 sampling event at Molycorp Questa Mine in Questa, New Mexico. This report contains the results and process of the sample specific data reviews and collective evaluations for the water samples collected in support of the Remedial Investigation/Feasibility Study (RI/FS) during the month of April 2003.

April 2003 RI/FS water samples were submitted to Severn Trent Laboratories (STL) Burlington in Colchester, Vermont for chemical analysis. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods utilized were according to the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). Sample and QC results were reported in 32 original and 1 re-analysis package.

Tables 1-1 and 1-2 summarize the groundwater and surface water samples collected during this sampling event, along with the analyses performed on each sample and the accompanying QC samples.

Table 1-1
Summary of Groundwater Samples Collected April 2003

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
CAPULIN1-T01N-SFW (WAT093A)	X	X	X/BOD	---	---	---
CAPULINSPRING-T01N-GRW (WAT092A)	X	X	X	---	---	---
CC1B-T01N-GRW (WAT091C)	X	X	X	---	---	---
CC2B-T01N-GRW (WAT091C)	X	X	X	---	---	---
COLUMBINENO1-T01N-GRW (WAT089A)	X, MS, LD	X, MS, LD	X, MS, LD	X, MS, MSD	X, MS, MSD	X, MS, MSD
COLUMBINENO2-T01N-GRW (WAT089A)	X	X	X	X	X	X
COMPCABINS-T01N-GRW (WAT074)	X	X	X	---	---	X
DOUGLASWELL-T01N-GRW (WAT089A)	X, FD	X, FD	X, FD	---	---	X
EW-1-T01N-GRW (WAT067C)	X	X	X	---	---	---
EW-2-T01N-GRW (WAT066C)	X	X	X	---	---	---
EW-3-T01N-GRW (WAT066C)	X	X	X	---	---	---
EW-4-T01N-GRW (WAT066C)	X. FD	X. FD	X, FD	---	---	---
EW-5A-T01N-GRW (WAT066C)	X	X	X	---	---	---
EW-5B-T01N-GRW (WAT066C)	X	X	X	---	---	---
EW-5C-T01N-GRW (WAT066C)	X	X	X	---	---	---
EW-5D-T01N-GRW (WAT066C)	X	X	X	---	---	---
EW-6 (MW-3)-T01N-GRW (WAT067C)	X	X	X	---	---	---
FAGERQUIST-T01N-GRW (WAT074C)	X	X	X	---	---	X
GWW-1-T01N-GRW (WAT064A)	X, MS, LD	X, MS, LD	X, MS, LD	---	---	---
GWW-2-T01N-GRW (WAT064A)	X	X	X	---	---	---
GWW-3-T01N-GRW (WAT064A)	X	X	X	---	---	---
GOATHILLSEEP-T01N-GRW (WAT076A)	X	X	X	---	---	---
GOATHILLSPRING-T01N-GRW (WAT092A)	X	X	X	---	---	---
LABWELL-T01N-GRW (WAT074C)	X	X	X			---
LOWERSPRING13-T01N-GRW (WAT076A)	X	X	X	---	---	---
LS-1-T01N-GRW (WAT070C)	X	X	X	---	---	---
LS-2-T01N-GRW (WAT070C)	X	X	X	---	---	---
LS-3-T01N-GRW (WAT070C)	X	X	X	---	---	---
MINE1-T01N-GRW (WAT082C)	X, MS, LD	X, MS, LD	X, MS, LD	X, MS, MSD	X, MS, MSD	X, MS, MSD
MMW-10A-T01N-GRW (WAT064A)	X	X	X	---	---	X
MMW-10B-T01N-GRW (WAT079C)	X	X	X	---	---	X
MMW-10C-T01N-GRW (WAT086A)	X	X	X	---	---	X, FB
MMW-11A-T01N-GRW (WAT086A)	X, FD	X, FD	X, FD	---	---	X, FD
MMW-11-T01N-GRW (WAT086A)	X, RB	X, RB	X, RB	---	---	X, RB
MMW-13-T01N-GRW (WAT086A)	X	X	X	---	---	X

Table 1-1
Summary of Groundwater Samples Collected April 2003

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
MMW-17A-T01N-GRW (WAT086A)	X	X	X	---	---	---
MMW-17B-T01N-GRW (WAT086A)	X	X	X	---	---	---
MMW-18B-T01N-GRW (WAT079C)	X	X	X	---	---	X
MMW-19A-T01N-GRW (WAT085A)	X, FD	X, FD	X, FD	---	---	X, FD
MMW-19B-T01N-GRW (WAT079C)	X	X	X	---	---	X
MMW-21-T01N-GRW (WAT084A)	X	X	X	X, FB	X, FB	X, FB
MMW-22-T01N-GRW (WAT086A)	X, RB	X, RB	X, RB	X, RB	X, RB	X, RB
MMW-23A-T01N-GRW (WAT090A)	X	X	X	---	---	---
MMW-23B-T01N-GRW (WAT091C)	X	X	X	---	---	---
MMW-24-T01N-GRW (WAT086A)	X	X	X	---	---	X
MMW-25B-T01N-GRW (WAT080C)	X, RB	X, RB	X, RB	---	---	X
MMW-28A-T01N-GRW (WAT064A)	X	X	X	X	X	---
MMW-28B-T01N-GRW (WAT084A)	X	X	X	X	X	X
MMW-29A-T01N-GRW (WAT064A)	X	X	X	---	---	X
MMW-29B-T01N-GRW (WAT079C)	X	X	X	---	---	X
MMW-2-T01N-GRW (WAT080C)	X	X	X	---	---	---
MMW-30A-T01N-GRW (WAT090A)	X	X	X	---	---	X
MMW-30B-T01N-GRW (WAT079C, 081A)	X	X	X	X	---	X
MMW-31A-T01N-GRW (WAT085A)	X	X	X	---	---	X
MMW-31B-T01N-GRW (WAT079C)	X	X	X	---	---	X
MMW-32A-T01N-GRW (WAT085A)	X	X	X	---	---	X
MMW-32B-T01N-GRW (WAT079C)	X	X	X	---	---	X
MMW-33A-T01N-GRW (WAT064A)	X	X	X	---	---	X
MMW-34B-T01N-GRW (WAT086A)	X, RB	X, RB	X, RB	X, RB	X, RB	X, RB
MMW-35B-T01N-GRW (WAT079C)	X	X	X	X	X	X
MMW-36B-T01N-GRW (WAT081A)	X	X	X	X	X	X
MMW-38A-T01N-GRW (WAT085A)	X	X	X	---	---	X
MMW-39A-T01N-GRW (WAT086A)	X	X	X	---	---	---
MMW-3-T01N-GRW (WAT079C)	X	X	X	---	---	---
MMW-40A-T01N-GRW (WAT079C)	X	X	X	X	X	X, FB
MMW-42A-T01N-GRW (WAT081A)	X	X	X	---	---	---
MMW-42B-T01N-GRW (WAT080C)	X	X	X	---	---	---
MMW-43A-T01N-GRW (WAT075C)	X	X	X	X	X	---
MMW-44A-T01N-GRW (WAT081A)	X	X	X	X	X	X
MMW-44B-T01N-GRW (WAT075C)	X	X	X	X	X	X
MMW-45A-T01N-GRW (WAT085A)	X	X	X	---	---	---
MMW-45B-T01N-GRW (WAT085A)	X	X	X	---	---	---
MMW-47A-T01N-GRW (WAT081A)	X, FD	X, FD	X, FD	X, FD	X, FD	X, FD
MMW-48A-T01N-GRW (WAT081A)	X, MS, LD	X, MS, LD	X, MS, LD	X	X	X
MMW-49A-T01N-GRW (WAT064A)	X	X	X	---	---	---
MMW-7-T01N-GRW (WAT084A)	X, FD	X, FD	X, FD	X, FD	X, FD	X, FD
MMW-8A-T01N-GRW (WAT080C)	X	X	X	X	X	X
MMW-8B-T01N-GRW (WAT081A)	X	X	X	X	X	X
MolyTunnel-T01N-GRW (WAT099C)	X	X	X	X	X	---
MW-10-T01N-GRW (WAT072C)	X, FD	X, FD	X, FD	---	---	---
MW-11-T01N-GRW (WAT072C)	X	X	X	---	---	---
MW-12-T01N-GRW (WAT078C)	X, RB	X, RB	X, RB	---	---	---
MW-13-T01N-GRW (WAT078C)	X	X	X	---	---	---
MW-14-T01N-GRW (WAT078C)	X	X	X	---	---	---
MW-15-T01N-GRW (WAT078C)	X, RB	X, RB	X, RB	---	---	---
MW-17-T01N-GRW (WAT078C)	X	X	X	X, FB	X, FB	---
MW-1-T01N-GRW (WAT072C)	X	X	X	---	---	---
MW-20-T01N-GRW (WAT078C)	X, FD	X, FD	X, FD	---	---	---

Table 1-1
Summary of Groundwater Samples Collected April 2003

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
MW-24-T01N-GRW (WAT078C)	X, RB	X, RB	X, RB	---	---	---
MW-2-T01N-GRW (WAT078C)	X	X	X	---	---	---
MW-4-T01N-GRW (WAT072C)	X	X	X	---	---	---
MW-7A-T01N-GRW (WAT072C)	X	X	X	---	---	---
MW-7C-T01N-GRW (WAT066C)	X	X	X	---	---	---
MW-9A-T01N-GRW (WAT072C)	X	X	X	---	---	---
MW-A-T01N-GRW (WAT067C)	X, MS, LD	X, MS, LD	X, MS, LD	---	---	---
MW-B-T01N-GRW (WAT067C)	X	X	X	---	---	---
MW-CH-T01N-GRW (WAT066C)	X, MS, LD	X, MS, LD	X,MS, LD	X	X	---
OUTFALL002-PIPE-T01N-SFW (WAT068C)						
OUTFALL002WELL-T01N-GRW (WAT077C)	X	X	X	---	---	---
P-1-T01N-GRW (WAT081A)	X	X	X	X	X	X
P-2-T01N-GRW (WAT081A)	X, MS, LD	X, MS, LD	X, MS, LD	X	X	X
P-3-T01N-GRW (WAT081A)	X, RB	X, RB	X, RB	---	---	X, RB
P-4B-T01N-GRW (WAT085A)	X	X	X	---	---	X
P-5B-T01N-GRW (WAT085A)	X	X	X	---	---	X, FB
P-5C-T01N-GRW (WAT085A)	X	X	X	---	---	X
SHAFTSPRING-T01N-GRW (WAT083A)	X	X	X	---	---	---
SPRING10-T01N-GRW (WAT071C)	X	X	X	---	---	---
SPRING12-T01N-GRW (WAT071C)	X	X	X	---	---	---
SPRING13PUMP-T01N-GRW (WAT090A)	X	X	X	---	---	---
SPRING13-T01N-GRW (WAT088A)	X	X	X	---	---	---
SPRING14A-T01N-GRW (WAT083A)	X	X	X	---	---	---
SPRING14M-T01N-GRW (WAT075C)	X	X	X	---	---	---
SPRING14T-T01N-GRW (WAT071C)	X	X	X	---	---	---
SPRING15-T01N-GRW (WAT071C)	X	X	X	---	---	---
SPRING17-T01N-GRW (WAT071C)	X, MS, LD	X, MS, LD	X, MS, LD	---	---	---
SPRING18-T01N-GRW (WAT071C)	X	X	X	---	---	---
SPRING39PUMP-T01N-GRW (WAT064A)	X	X	X	---	---	---
SPRING39-T01N-GRW (WAT076A)	X	X	X	---	----	---
SPRING39-T01N-GRW (WAT103A)	X	X	X	---	---	---
SPRING9A-T01N-GRW (WAT071C)	X	X	X	---	---	---
SPRING9-T01N-GRW (WAT071C)	X	X	X	---	---	---
US-1-T01N-GRW (WAT070C)	X	X	X	---	---	---
US-2-T01N-GRW (WAT070C)	X	X	X	---	---	---
US-3-T01N-GRW (WAT070C)	X	X	X	---	---	---
Number GW samples	124	124	124	26	25	47
Number MS/MSD or MS/LD	8	8	8	2	2	4
Number Field Duplicates	8	8	8	2	2	4
Number Rinsate Blanks	8	8	8	2	2	4
Number Field Blanks	NA	NA	NA	2	2	4

NA = Not Applicable MS = Matrix Spike LD = Laboratory Duplicate MSD = Matrix Spike Duplicate FD = Field Duplicate

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

*The two sample sites "CAPULIN" and "OUTFALL002" are considered to be more representative of groundwater despite the matrix code of "SFW." In future events, a matrix code of "GRW" was assigned.

Table 1-2
Summary of Surface Water Samples Collected April 2003

Sample Identification	Total Metals	Dissolved Metals	Inorganics	BOD/COD
DECANT-T01N-SFW (WAT069C)	X	X	X	X
RR-10A1-T01N-SFW (WAT073C)	X	X	X	X
RR-10-T01N-SFW (WAT073C)	X	X	X	X
RR-11A1-T01N-SFW (WAT073C)	X	X	X	X
RR-11C-T01N-SFW (WAT073C)	X, MS, LD	X, MS, LD	T, MS, LD	X, MS, LD
RR-12-T01N-SFW (WAT073C)	X	X	X	X
RR-13-T01N-SFW (WAT073C)	X	X	X	X
RR-14-T01N-SFW (WAT073C)	X	X	X	X
RR-16-T01N-SFW (WAT073C)	X, FD	X, FD	X, FD	X, FD
RR-7-T01N-SFW (WAT073C)	X	X	X	X
RR-DS-SPRING 13-T01N-SFW (WAT088A)	X	X	X	X
RR-DS-SPRING13-T01N-SFW (WAT065C)	X	X	X	X
RR-DS-SPRING39-T01N-SFW (WAT065C)	X, RB	X, RB	X, RB	X, RB
RR-US-SPRING13-T01N-SFW (WAT065C)	X	X	X	X
RR-US-SPRING13-T01N-SFW (WAT088A)	X	X	X	X
RR-US-SPRING39-T01N-SFW (WAT065)	X	X	X	X
STORM1-T01N-SFW (WAT103A)	X	X	X	---
Number SFW samples	17	17	17	16
Number MS/MSD or MS/LD	1	1	1	1
Number Field Duplicates	1	1	1	1
Number Rinsate Blanks	1	1	1	1

MS = Matrix Spike LD = Laboratory Duplicate FD = Field Duplicate

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

Aluminum, arsenic, and cadmium were reanalyzed for sample OUTFALL002WELL-D01N-GRW. This sample was originally analyzed in Data Package WAT077C for the full metals suite. These three metals were reanalyzed in Data Package WATRAS4 without dilution to obtain reporting limits sufficiently low to allow comparison of the calculated daily load to permit limits. The results for the reanalyses were selected for reporting over the initial results. The data sheets have been marked accordingly.

The data review process evaluated sample-specific and laboratory performance criteria in accordance with the standard operating procedure (SOP) 12.1. As mentioned in the SOP, all RI/FS data generated for the Questa Mine received an evaluation of sample-specific parameters. In addition, 10% of the data packages (per analysis type per event/episode) were reviewed for laboratory performance parameters. The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Sample-specific reviews evaluated the following sample related parameters:

- Case narrative comments
- Chain-of-Custody/Sample Receipt
- Holding Times
- Method Blank (Preparation Blank)
- Matrix-Dependent Quality Control
  - Matrix Spike Analysis
  - Laboratory duplicate Analysis
- Method-Specific Quality Control Measures
  - Inorganic Method Specific QC Measures
    - Post Digestion Spike Analysis
    - ICP Serial Dilution Tests
    - Internal Standard Performance
    - Cation/Anion Balance Evaluation
  - Organic Method Specific QC Measures
    - Surrogate Spike Compound Recovery
    - Internal Standards
- Total versus Partial Balance
- Field quality control samples
  - Field Duplicate Agreement
  - Rinsate Blank Results
  - Field Blank Results
  - Trip Blank Results

Evaluation of laboratory performance parameters provided an overall representation of the analytical system at the time the samples were analyzed. The laboratory performance review evaluated parameters in control of the laboratory, but independent of the field samples analyzed, as follows:

- Initial Calibration
- Continuing Calibration Verification
- Laboratory Control Sample Analysis

- Compound Identification
- Target Analyte Quantification
- Verification
- Method Specific Quality Control Checks

If any potential systematic problems were determined upon review of the laboratory performance parameters in any of the selected packages evaluated (meeting the 10% criteria), the review parameter was evaluated in all data packages for April 2003 to determine the need for data qualification. Instances, in which professional judgement was exercised in evaluating the need for data qualification, the basis for this rationale was provided in the data review summary.

Upon completion of the sample-specific reviews and laboratory performance reviews, a collective assessment for the event was performed. Site-specific matrix spike, laboratory duplicate, serial dilution, blank (field and rinsate), and field duplicate results were assessed collectively by matrix per event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered more representative of the site sample matrix and a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 describes sample specific data review findings and several data quality issues affecting all of the water packages. Section 5.0 presents the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Section 6.0 summarizes the collective summary of the field QC results (field and rinsate blanks, when applicable, and field duplicate results) and the resultant sample qualification. Lastly, an overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

4.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for data packages WAT064-WAT093, WAT099, and WAT103. In addition, the reanalysis data package, WATRAS4, is presented, for a total of 32 original data packages and one reanalysis package. In order to attain the frequency requirements for laboratory performance reviews, a total of four data packages (WAT064A, WAT074C, WAT082C, and WAT099C) were evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

4.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were identified which globally affected all relevant water samples analyzed for the April 2003 Groundwater and Surface Water event**.** Although most of the issues have been addressed in the individual summary reports, these common issues and conclusions are summarized below:

4.2.1 Holding Blanks

For the analysis of the volatile organic samples, a holding blank was carried through the sample storage period and analyzed in the same sequence as the samples in the data package. As all holding blank recoveries were all nondetect, the indication of the occurrence of potential cross-contamination during sample storage was unlikely.

4.2.2 Manual Integration

Manual integration was employed in deriving results for the volatile and semivolatile organics in a few data packages. The values that were derived from manual integration were qualified on the quantitation reports and extracted ion current profiles were included for each instance. The supporting documentation provided was reviewed and found to be adequate.

4.2.3 Low-Level Detections

Detected organic analytes with concentrations between the Method Detection Limit (MDL) and the Reporting Limit (RL) were qualified as estimated (J). A qualifier code of “SQL-I” (Sample Quantitation Limit) was assigned to reflect the greater uncertainty in quantitative values below the RL.

4.2.4 TICS Reported in Blanks

Several Tentatively Identified Compounds (TICs) were reported as present in the semivolatile blanks for each package in which semivolatile data were analyzed. TICs in method blanks are denote considered to be reportable as TICs for samples and such identifications were rejected, flagged as unusable (R). The multiple unknown compounds not detected in the method blank

were qualified as (NJ) to not the analyses indicated the presence of an analyte that had been "tentatively identified" and the associated numerical value represented its approximate value.

4.2.5 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

4.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgement, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilbria were found to affect the matrix spike recoveries more than the expected accuracy of the analyses. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assess for accuracy of the analysis.

4.2.7 Non-Valid Matrix Spikes

There were a total of three scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. First, when native sample concentrations were greater than or equal to four times the spiking concentration, the ability to determine accuracy in the analysis was not accurate as the difference in the spike level with the original analyte concentration was not so dicernable due to high concentration levels. In addition, there were several instances in which the reporting limits for various metal analytes were increased due to dilution factors, which affected the reliable quantitation of several spiked metals. In these situations, the reporting limit was greater than the spike concentration added. Related to this scenario, is the last instance in which the difference between the RL concentration and the spike concentration was less than the RL value.

4.2.8 Laboratory Performance Review (LPR) Findings

As mentioned previously, four data packages were given a full validation to assess the performance of the laboratory for all analyses. Any findings resulting in data qualification were examined in all other April 2003 Groundwater and Surface water packages to determine if data qualification would be extended to these additional packages.

- Continuing Calibration Verification (CCV) results were reviewed in all metal results. No additional data qualification resulted, as all were either within the acceptance recovery range of 90-110% or were not applicable to any of the samples in the sequence run. Only data package WAT064A contained samples, which were qualified on the basis of CCV recoveries.
- Initial Calibration Verification (ICV) results were reviewed for all SVOC analyses and subsequently resulted in the qualification of the following target analytes for all SVOC samples: 2,4-Dimethylphenol, 3-Nitroaniline, 2,4-Dinitrophenol, and 4-Nitrophenol as estimated (J/UJ) with a low bias direction assigned.

Inorganic parameter matrix QC consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. Organic parameter QC consisted of matrix spike/matrix spike duplicate (MS/MSD) analyses. The site-specific matrix QC results were assessed collectively for the April 2003 Groundwater and Surface Water Sampling Event by matrix (groundwater versus surface water, and total versus dissolved fractions) to determine the need for qualification of sample results of similar matrix. Sections 5.3 through 5.3 present the collective matrix QC results associated with the samples in this event and the resultant data qualifiers.

5.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent quality control (QC) samples were used to evaluate how the sample matrix affected the accuracy and precision of the analytical results. Eight groundwater field samples were designated for both total/dissolved metals, and inorganics matrix spike analyses. Four groundwater field samples were designated for semivolatile, volatile, and explosives organics matrix spike analyses. One surface water field sample was designated for total/dissolved, and inorganic matrix spike analyses, as summarized in Table 5-1. Table 5-2 summarizes the breakdown of frequency requirements for each of the analyses per groundwater and surface water for the April 2003 Groundwater and Surface Water Sampling Event.

Table 5-1
Field Samples Designated for Matrix QC Analysis

Sample ID	Analyses					
	Total Metals	Dissolved Metals	Inorganics	VOCs	SVOCs	Explosives
GROUNDWATER						
GWW-1-D01N-GRW (WAT064A)	X	X	X	---	---	---
MW-CH-D01N-GRW (WAT066C)	X	X	X	---	---	---
MW-A-D01N-GRW (WAT067C)	X	X	X	---	---	---
SPRING17-D01N-GRW (WAT071C)	X	X	X	---	---	---
MMW-48A-D01N-GRW-(WAT081A)	X	X	X	X	X	X
P-2-D01N-GRW (WAT081A)	X	X	X	X	X	X
Mine1-D01N-GRW (WAT082C)	X	X	X	X	X	X
COLUMBINENO1-D01N-GRW (WAT089A)	X	X	X	X	X	X
SURFACE WATER						
RR-11C-D01N-SFW (WAT073C)	X	X	X	---	---	---

Table 5-2
Frequency Requirements for Matrix QC

Analyses	# MS Samples	Total # Samples	Percentage (%)
GROUNDWATER			
Total Metals	8	124	6.4
Dissolved Metals	8	124	6.5
Inorganics	8	124	6.4
VOC	4	26	15.4
SVOC	4	25	16.0
Explosives	4	47	8.5
SURFACE WATER			
Total Metals	1	17	5.3
Dissolved Metals	1	17	5.3
Inorganics	1	17	5.3
BOD_5/COD	1	16	5.9

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

5.1.1 Organic Matrix Spike Results

Table 5-3 summarizes the average matrix recoveries for the organic target analytes, along with the laboratory's historical limits and additional action, when warranted.

Table 5-3
Organics Matrix Spike Results

Analyte	Fraction	Historical Laboratory Recovery	Average % Recovery	Action
1,1-Dichloroethene	VOC	61-145	92.5	None
Benzene	VOC	76-127	100.5	None
Trichloroethene	VOC	71-120	109.5	None
Toluene	VOC	76-125	99.0	None
Chlorobenzene	VOC	75-130	99.5	None
Phenol	SVOC	12-110	78.3	None
2-Chlorophenol	SVOC	27-123	79.8	None
N-Nitroso-di-n-propylamine	SVOC	41-116	77.8	None
4-Chloro-3-methylphenol	SVOC	23-97	83.3	None
Acenaphthene	SVOC	46-118	76.8	None
2,4-Dinitrotoluene	SVOC	24-96	70.5	None
4-Nitrophenol	SVOC	10-80	76.0	None
Pentachlorophenol	SVOC	9-103	97.6	None
Pyrene	SVOC	26-127	85.3	None
HMX	Explosives	83-122	90.5	None
RDX	Explosives	81-116	99.8	None
2,4,6-Trinitrotoluene	Explosives	75-106	91.0	None
PETN	Explosives	75-110	80.8	None
PYX	Explosives	70-130	24.8*	All results J/UJ MS-L

*Out of 4 matrix spike recoveries for PYX, three were $\leq$15%

All matrix spike recoveries for organics analyses (VOCs, SVOCs, Explosives, and Pesticides/ PCBs) were within the historical acceptance range, or otherwise considered an acceptable recovery (between 75-125%), with the exception of PYX. Accordingly, no data qualification was necessary for any organic result on the basis of matrix spike recovery, with the exception of PYX results. As the average recovery for PYX was below 30%, and noting that of the four matrix spike recoveries for this analyte, three results were ≤15%, all results for PYX were qualified as estimated (J/UJ) with a low bias direction assigned. Nondetect PYX results were not rejected for samples other than the two parent samples for which a percent recovery of ≤ 10% was obtained.

5.1.2 Inorganic Matrix Spike Results

A number of matrix spike recoveries were outside of the acceptance limits of 75-125% for both inorganics and metals. Tables 5-4 and 5-5 summarize the results for each analyte, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 5-4
Inorganics Matrix Spike Results

Analyte	Number of Valid Spikes/ Total Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
INORGANICS GROUNDWATER					
Chloride	8/8	0	0	100.5	None
Nitrate	8/8	0	0	103.5	None
Fluoride	8/8	0	0	94.6	None
Ammonia	8/8	0	0	82.7	None
TKN	8/8	0	0	95.0	None
Nitrite	8/8	0	0	101.6	None
Ortho-phosphate	7/8	0	0	99.5	None
Phosphorus	8/8	0	0	98.5	None
Sulfate	8/8	2	3	102.2	J/UJ MS-I all total samples
TOC	8/8	2	1	83.8	J/UJ MS-I all total samples
INORGANICS SURFACE WATER					
Chloride	1/1	0	0	108.0	None
Nitrate	1/1	0	0	110.7	None
Fluoride	1/1	0	0	97.5	None
Ammonia	1/1	1	0	74.2	J/UJ parent sample only
TKN	1/1	0	0	105.0	None
Nitrite	1/1	0	0	100.0	None
Ortho-phosphate	1/1	1	0	64.9	J/UJ parent sample only
Phosphorus	1/1	0	0	101.6	None
Sulfate	1/1	0	0	78.0	None
TOC	1/1	0	0	108.0	None
BOD_5	1/1	0	0	100.5	None
COD	1/1	0	1	136.0	J/UJ parent sample only

Table 5-5
Metals Matrix Spike Results

Analyte	Total				Dissolved				Action
	# Valid	%R <75%	%R > 125%	Avg %R	# Valid	%R <75%	%R > 125%	Avg %R	
METALS GROUNDWATER									
Aluminum	4/8	0	0	104.4	5/8	0	0	103.6	None
Antimony	8/8	0	1	107.5	8/8	0	1	106.4	J MS-H to parent only when applicable
Arsenic	8/8	0	1	111.8	7/8	0	0	107.6	J MS-H to parent only when applicable
Barium	8/8	0	1	106.0	8/8	0	1	104.3	J MS-H to parent only when applicable
Beryllium	8/8	0	1	106.8	8/8	0	1	106.5	J MS-H to parent only when applicable
Boron	8/8	0	1	109.0	8/8	0	1	107.6	J MS-H to parent only when applicable
Cadmium	8/8	0	1	102.4	8/8	0	0	98.7	J MS-H to parent only when applicable
Chromium	7/8	0	0	103.1	7/8	0	0	101.1	None
Cobalt	8/8	0	1	104.1	8/8	0	1	102.8	J MS-H to parent only when applicable
Copper	8/8	0	0	105.1	8/8	1	0	98.1	J/UJ MS-L to parent sample only
Iron	5/8	0	2	118.0	5/8	0	0	107.3	J MS-H to parent only when applicable
Lead	8/8	0	1	113.6	8/8	0	1	108.3	J MS-H to parent only when applicable
Manganese	3/8	0	0	104.2	4/8	0	0	106.8	None
Mercury	8/8	0	0	103.3	8/8	0	0	106.3	None
Molybdenum	8/8	0	1	106.4	8/8	0	1	103.5	J MS-H to parent only when applicable
Selenium	8/8	0	1	107.1	8/8	0	3	118.7	J MS-H to parent only when applicable
Nickel	8/8	0	1	111.3	8/8	0	1	110.0	J MS-H to parent only when applicable
Thallium	8/8	0	0	112.6	8/8	0	0	112.4	None
Silver	8/8	0	1	111.1	8/8	0	0	108.6	J MS-H to parent only when applicable
Vanadium	8/8	0	0	109.8	8/8	0	0	108.9	None
Zinc	4/8	1	0	95.1	6/8	0	0	99.5	J/UJ parent sample only
Cyanide	8/8	2	0	70.1	//	//	//	//	**J/UJ MS-L all total GRW**
METALS SURFACE WATER									
Aluminum	1/1	0	0	111.8	1/1	0	0	105.5	None
Antimony	1/1	0	0	102.2	1/1	0	0	100.0	None
Arsenic	1/1	0	0	98.1	1/1	0	0	99.2	None
Barium	1/1	0	0	100.1	1/1	0	0	101.5	None
Beryllium	1/1	0	0	99.7	1/1	0	0	100.2	None
Boron	1/1	0	0	102	1/1	0	0	102.5	None
Cadmium	1/1	0	0	100.3	1/1	0	0	101.3	None

Table 5-5
Metals Matrix Spike Results

Analyte	Total				Dissolved				Action
	# Valid	%R <75%	%R > 125%	Avg %R	# Valid	%R <75%	%R > 125%	Avg %R	
Cobalt	1/1	0	0	99.4	1/1	0	0	100.0	None
Copper	1/1	0	0	104.4	1/1	0	0	106.3	None
Iron	1/1	0	0	113.6	1/1	0	0	106.5	None
Lead	1/1	0	0	89.9	1/1	0	0	114.5	None
Manganese	1/1	0	0	100.4	1/1	0	0	101.1	None
Mercury	1/1	0	0	103	1/1	0	0	102.0	None
Molybdenum	1/1	0	0	99.9	1/1	0	0	100.7	None
Selenium	1/1	0	0	75.5	1/1	0	0	77.7	None
Nickel	1/1	0	0	101.6	1/1	0	0	102.7	None
Thallium	1/1	0	0	116.6	1/1	0	0	113.5	None
Silver	1/1	0	0	113.6	1/1	0	0	111.0	None
Vanadium	1/1	0	0	105.5	1/1	0	0	110.7	None
Zinc	1/1	0	0	97.1	1/1	0	0	98.0	None
Cyanide	1/1	0	0	105.8	1/1	0	0	//	None

// Cyanide was not analyzed for dissolved metal fractions

Qualifications which resulted are in bold type

In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

With the exception of sulfate and TOC, data qualification was limited to parent samples only. Qualification was extended to all sulfate and TOC results because greater than a quarter of the matrix spike recoveries were outside of the acceptance ranges. The table above indicates that the accuracy of the analyses relative to the site-specific matrix was generally acceptable as few recoveries were out and most average recoveries were within limits.

With the exception of cyanide, data qualification was limited to the parent samples. Two of the parent sample results for cyanide were qualified as rejected, considered unusable, as both percent recoveries were below 30%. These two low recoveries potentially biased the average matrix spike recovery low. In conjunction with historical cyanide matrix spike recoveries, all cyanide results were qualified as estimated (J/UJ) with a low bias direction assigned. Of all the potential high bias qualifications for elevated matrix spike recoveries, only lead resulted in qualification, as the remaining sample results were nondetect. As indicated in the table, the accuracy of the analyses relative to the site-specific matrix was generally acceptable, as the majority of unacceptable recoveries did not result in qualification. Those that did were infrequent. In addition, most average recoveries were within the limits.

5.1.3 Post-Digestion Spikes

Post-digestion spikes were conducted on all ICP and ICP/MS analytes to determine whether matrix recoveries outside of the acceptance range were the result of sample matrix, or due to a bias in the analytical system. All post digestion recoveries for those analytes recovered outside of the acceptance range were reviewed and recovered within the range of 75-125%. Therefore, no qualification of data was assigned for any of the metal analytes on the basis of post-digestion spike recovery, as it was likely that all matrix spike exceedances were due to a matrix effect on digestion rather than a bias in the analytical system.

5.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Laboratory duplicate sample results were evaluated to assess the precision of the laboratory analyses. Eight groundwater samples and one surface water sample were designated for metals, dissolved metals, and inorganic parameters laboratory duplicate analysis. The evaluation criteria used are summarized in SOP 12.1. For metals, the Contract Laboratory (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

With relatively few exceptions, the RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within the QAPP acceptance limits. The following table summarizes the laboratory duplicate results for any of the metals or inorganics analytes, which exhibited disagreements in concentrations

resulting in the data qualification in the parent samples. No qualification of inorganic data was necessary on the basis of laboratory duplicate results at the global level.

As all samples designated for matrix spike analyses (MS) were also designated for either a matrix spike duplicate (MSD) or laboratory duplicate (LD) analysis, the sample frequency for the analyses of laboratory duplicates is the same as summarized in Table 5-2. Table 5-6 summarizes number of laboratory duplicate results that did not meet evaluation criteria.

Table 5-6
Inorganic Laboratory Duplicate Results

Analyte	Frequency of Exceedance	Additional Action
METAL ANALYTES		
Aluminum (GRW)	1/9	None
Cadmium (GRW)	2/9	None
Lead (SFW)	1/9	None
Manganese (GRW)	1/9	None
Selenium (GRW)	2/9	None
Zinc (GRW)	3/9	None
Chloride (GRW)	1/9	None
INORGANICS ANALYTES		
Bicarbonate Alkalinity (GRW)	1/9	None
Total Alkalinity (GRW)	1/9	None
Orthophosphate (GRW)	1/9	None

All of the laboratory results that were qualified on the basis of laboratory duplicate disagreement were limited to parent sample results because less than a quarter of the laboratory duplicate results were out. In the case of lead in the single surface water laboratory duplicate analysis, the exceedance was marginal. Based on the LD results, the overall level of precision demonstrated is considered to be acceptable.

5.3 ICP SERIAL DILUTION RESULTS

ICP serial dilutions were performed on metal samples in every data package. These analyses were run on the same samples as were designated for QC analyses, or otherwise selected in data packages in which there were no QC samples. These analyses were used to evaluate whether or not significant physical or chemical interferences existed due to sample matrix. This was accomplished by analyzing the sample and a five-fold dilution of the sample. The percent difference (%D) between these two concentrations was compared to an acceptance criterion of $\leq$10%, only for those analytes for which the serial dilution analysis was applicable. Analytes were applicable if the initial concentrations were sufficiently higher (50x) than the IDL, accounting for dilution. Generally, the diluted result is considered more accurate as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result. The following table summarizes each sample utilized for a serial dilution analysis, along with the associated applicable analytes, and the analytes for which qualification in the parent sample was necessary (in bold).

Qualifications were generally limited to the parent samples if less than a quarter of the valid serial dilution results were outside of the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set and the magnitude of outages were also taken into consideration. Evaluation of the serial dilution results collectively did not result in any additional qualification of results. The analysis was considered to be in control and did not indicate a pervasive matrix analytical problem. Table 5-7 summarizes the average % Ds for each of the analytes, broken down into total and dissolved fractions, along with the percent of applicable analytes that exceeded control criteria (10%).

Table 5-7
ICP Serial Dilution Results

Sample ID	Applicable Analytes (%D>10% in bold)
GROUNDWATER –DISSOLVED FRACTION	
GWW-1-D01N-GRWMS (WAT064A)	Mn
MW-CH-D01N-GRW (WAT066C)	---
MW-A-D01N-GRW (WAT067C)	Mn
SPRING17-D01N-GRW (WAT071C)	---
MMW-48A-D01N-GRW (WAT081A)	Al, Ca, Fe, Mg, Mn, Zn
P-2-D01N-GRW (WAT081A)	Al, Mn, Zn
MINE1-D01N-GRW (WAT082C)	Ba,Be, B, Ca, Cr, Cu, Fe, Mg, Mn, Mo, Na, Zn **Cd (11.0), Co (11.5), Ni (12.5)**
COLUMBINENO1-DO1N-GRW (WAT089A)	Mn, Zn
GROUNDWATER –TOTAL FRACTION	
GWW-1-T01N-GRW (WAT064A)	Mn
MW-CH-T01N-GRW (WAT066C)	---
MW-A-T01N-GRW (WAT067C)	Mn
LS-1-T01N-GRW (WAT70C)	Ca, Mg
SPRING17-T10N-GRW (WAT071C)	---
MW-7A-T01N-GRW (WAT072C)	Ca
COMPCABINS-T01N-GRW (WAT074C)	Ca
MMW-43A-T01N-GRW (WAT075C)	Al, Cd, Fe, Mg, Mn, Na, Zn
GOATHILLSEEP-T01N-GRW (WAT076A)	---
LOWERSPRING13-T01N-GRW (WAT076A)	Mn
OUTFALL002SUMP-T01N-GRW (WAT077C)	Ca,Mn, Mo
MW-24-T01N-GRW (WAT078C)	---
MMW-40A-T01N-GRW (WAT079C)	Ca
MMW-25B-T01N-GRW (WAT080C)	**Ca (13.9)**
MMW-48A-T01N-GRW (WAT081A)	Al, Ca, Fe, Mg, Mn, Zn
P-2-T01N-GRW (WAT081A)	Al, Mn, Zn
MINE1-T01N-GRW (WAT082C)	Ba, Be, B, Cd, Ca, Cr, Co, Cu, Mn, Mo, Ni, Na, Zn
SHAFTSPRING-T01N-GRW (WAT083A)	---
MMW-28B-T01N-GRW (WAT084A)	---
MMW-38A-T01N-GRW (WAT085A)	Al, **Be (29.6), Ni (14.0)**
RB01T-GRW (WAT087C)	---
MMW-22-T01N-GRW 9WAT086A)	Cu, Fe, Mn,
COLUMBINENO1-T01N-GRW (WAT089A)	Mn, Zn
MMW-30A-T01N-GRW (WAT090A)	Mn
MMW-23B-T01N-GRW (WAT091C)	---
CAPULINSPRING-T01N-GRW (WAT092A)	Mn

Table 5-7
ICP Serial Dilution Results

Sample ID	Applicable Analytes (%D>10% in bold)
MolyTunnel-T01N-GRW (WAT099C)	Ca, Fe, Mn
SURFACE WATER-TOTAL FRACTION	
RR-US-SPRING39-T01N-SFW (WAT065C)	---
OUTFALL002PIPE-T01N-SFW (WAT068C)	Ca, Mo
DECANT-T01N-SFW (WAT069C)	Mo, K, **Ca (12.6), Mn (11.6)**
RR-11C-T01N-SFW (WAT073C)	Ca, Mn
RR-US-SPRING13-T01N-SFW (WAT088A)	---
CAPUL1N-T01N-SFW (WAT093A)	Mn
STORM1-T01N-SFW (WAT103A)	Mn, Mo

---Indicates the serial dilution was not applicable to any of the metal analytes.

Table 5-8 summarizes the average % D for each analyte, the number of serial dilution results that were considered valid and in excess of 10%, and the resultant qualifiers based on the collective assessment.

Table 5-8
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	Avg. %D	%Ds >10%	# of Valid Results	% Valid Result >10%	Avg. %D	%Ds >10%	# of Valid Results	% Valid Result >10%	
GROUNDWATER									
Aluminum	2.1	0	3	0%	1.0	0	1	0%	None
Antimony	---	0	0	0%	---	0	0	0%	None
Arsenic	---	0	0	0%	---	0	0	0%	None
Barium	2.2	0	1	0%	7.0	0	0	0%	None
Beryllium	17.5	1	2	50%	9.4	0	1	0%	None
Boron	2.5	0	1	0%	5.7	0	1	0%	None
Cadmium	6.1	0	2	0%	11.0	1	1	100%	None
Calcium	3.9	1	8	12.5%	1.4	0	2	0%	None
Chromium	4.0	0	1	0%	9.2	0	1	0%	None
Cobalt	7.1	0	1	0%	11.5	1	1	100%	None
Copper	4.4	0	2	0%	4.7	0	1	0%	None
Iron	3.9	0	4	0%	4.7	0	2	0%	None
Lead	---	0	0	0%	---	0	0	0%	None
Magnesium	1.2	0	4	0%	0.6	0	2	0%	None
Manganese	4.0	0	13	0%	1.8	0	6	0%	None
Molybdenum	4.2	0	2	0%	8.6	0	1	0%	None
Nickel	10.8	1	2	50%	12.5	1	1	100%	None
Potassium	---	0	0	0%	---	0	0	0%	None
Selenium	---	0	0	0%	---	0	0	0%	None
Silver	---	0	0	0%	---	0	0	0%	None
Sodium	3.4	0	2	0%	3.0	0	1	0%	None
Thallium	---	0	0	0%	---	0	0	0%	None
Vanadium	---	0	0	0%	---	0	0	0%	None
Zinc	2.5	0	5	0%	3.1	0	4	0%	None

Table 5-8
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	Avg. %D	%Ds >10%	# of Valid Results	% Valid Result >10%	Avg. %D	%Ds >10%	# of Valid Results	% Valid Result >10%	
SURFACE WATER									
Aluminum	---	0	0	0%	---	---	---	---	---
Antimony	---	0	0	0%	---	---	---	---	---
Arsenic	---	0	0	0%	---	---	---	---	---
Barium	---	0	0	0%	---	---	---	---	---
Beryllium	---	0	0	0%	---	---	---	---	---
Boron	---	0	0	0%	---	---	---	---	---
Cadmium	---	0	0	0%	---	---	---	---	---
Calcium	7.6	1	3	33.3%	---	---	---	---	None
Chromium	---	0	0	0%	---	---	---	---	---
Cobalt	---	0	0	0%	---	---	---	---	---
Copper	---	0	0	0%	---	---	---	---	---
Iron	---	0	0	0%	---	---	---	---	---
Lead	---	0	0	0%	---	---	---	---	---
Magnesium	---	0	0	0%	---	---	---	---	---
Manganese	7.1	1	2	50%	---	---	---	---	None
Molybdenum	2.8	0	2	0%	---	---	---	---	None
Nickel	---	0	0	0%	---	---	---	---	---
Potassium	9.1	0	1	0%	---	---	---	---	None
Selenium	---	0	0	0%	---	---	---	---	---
Silver	---	0	0	0%	---	---	---	---	---
Sodium	---	0	0	0%	---	---	---	---	---
Thallium	---	0	0	0%	---	---	---	---	---
Vanadium	---	0	0	0%	---	---	---	---	---
Zinc	---	0	0	0%	---	---	---	---	---

Groundwater Discussion

Although all applicable serial dilution results for dissolved cadmium, dissolved cobalt, and dissolved nickel were out (note: one of one), it was not considered necessary to issue data qualification to the remainder of the data set because one result was not sufficient to establish a matrix analytical problem, nor a bias direction related to dilution. One serial dilution result out of two applicable results in excess of 10% was reported for both nickel and beryllium. In the case of beryllium, the two applicable %Ds were 5.4% and 29.6%, resulting in an average % D of 17.5%. Using professional judgement, it was determined that this average %D was not truly representative of the potential matrix interference on beryllium and consequently did not warrant overall data qualification. In the case of nickel, the two % Ds for the applicable results were 7.6% and 14.0%, resulting in an average of 10.8%. Due to the fact that this average % D was marginally greater than the evaluative criteria of 10%, no global data qualification of these analyte results were considered necessary. In general, qualification was limited to the parent samples because exceedances were few and marginal in magnitude.

Surface Water Discussion

Qualifications for calcium, manganese, molybdenum and potassium were limited to the parent samples only as the number of exceedances were minimal and all average %D were less than 10%. The remaining analytes did not exhibit high enough native concentrations to be valid for the serial dilution analysis.

In general, the serial dilution results suggest that matrix interferences were minimal.

Site-specific field duplicate samples, rinsate blanks, and field blanks were assessed collectively by matrix for the April 2003 Groundwater and Surface Water Sampling Event to determine the need for qualification of sample results of similar matrices. The sections to follow summarize the results for these QC samples and any collective qualifications arising from the assessments.

6.1 FIELD DUPLICATE AGREEMENT

The field duplicate agreement assessment evaluated the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, as follows. When both concentration results were sufficiently greater (5x) the CRDL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤30%. If one or both of the concentration results were less than 5x the CRDL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤2x the CRDL. Again, the frequency of the field duplicate samples followed the frequency of matrix spike and laboratory duplicate analyses, as the same samples were designated for all QC parameters. The breakdown of field duplicate pair samples per analysis and fraction can be referenced in Table 6-1.
Table 6-2 summarizes the sample sites, which were duplicated and notated as field duplicate samples, per parameter.

Table 6-1
Summary of Field Duplicate Samples Collected April 2003

Sample ID	Analyses						
	Total Metals	Dissolved Metals	Inorganics	VOCs	SVOCs	Explosives	BOD/ COD
EW-4-T01N/T01D-GRW (WAT066C)	X	X	X	---	---	---	---
EW-4-D01N/D01D-GRW (WAT066C)	X	X	---	---	---	---	---
MW-10-T01N/T01D-GRW (WAT072C)	X	X	X	---	---	---	---
MW-10-D01N/D01D-GRW (WAT072C)	X	X	---	---	---	---	---
RR-16-T01N/T01D-SFW (WAT073C)	X	X	X	---	---	---	X
RR-16-D01N/D01D-SFW (WAT073C)	X	X	---	---	---	---	---
MW-20-T01N/T01D-GRW (WAT078C)	X	X	X	---	---	---	---
MW-20-D01N/D01D-GRW (WAT078C)	X	X	---	---	---	---	---
MMW-47A-T01N/T01D-GRW (WAT081A)	X	X	X	X	X	X	---
MMW-47A-D01N-D01D-GRW (WAT081A)	X	X	---	---	---	---	---
MMW-7-T01N/T01D-GRW (WAT084A)	X	X	X	X	X	X	---
MMW-7-D01N-D01D-GRW (WAT084A)	X	X	---	---	---	---	---
MMW-19-T01N/T01D-GRW (WAT085A)	X	X	X	---	---	X	---
MMW-19-D01N/D01D-GRW (WAT085A)	X	X	---	---	---	---	---
MMW-11-T01N/T01D-GRW (WAT086A)	X	X	X	---	---	X	---
MMW-11-D01N/D01D-GRW (WAT086A)	X	X	---	---	---	---	---
DOUGLASWELL-T01N/T01D-GRW (WAT089A)	X	X	X	---	X	---	---
DOUGLASWELL-D01N/D01D-GRW (WAT089A)	X	X	---	---	---	---	---

Table 6-2
Field Duplicate Collection Frequency for the April, 2003 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	8	124	6.4
Dissolved Metals	8	124	6.5
Inorganics	2	25	8.0
VOC	2	26	7.7
SVOC	2	25	8.3
Explosives	4	47	8.5
SURFACE WATER			
Total Metals	1	17	5.3
Dissolved Metals	1	17	5.3
BOD/COD	1	16	5.9

Only one pair of field duplicate samples resulted in the qualification of data on the basis of disagreement, as noted in the sample specific review for data package WAT078C. Phosphorus results in samples MW-20-T01N-GRW and MW-20-T01D-GRW were qualified as estimated (J) with an indeterminate bias direction assigned, as it was uncertain which of the two results was more accurate. As all other field duplicate comparisons met the criteria as specified in the QAPP, no additional qualifications were considered necessary as a result of the overall assessment. Based on the FD results, the overall level of precision demonstrated is considered to be acceptable.

6.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blank samples were prepared by pouring ASTM type II water/laboratory supplied “reagent-free” water over decontaminated sampling equipment and collecting the water in the appropriate sampling containers. Rinsate blanks are prepared in an identical manner to the samples with which they are associated. Table 6-3 summarizes the rinsate blank samples associated with the samples collected during the April Groundwater and Surface water sampling event. The QAPP required frequency of 5% for the collection of rinsate blanks was met for the April 2003 sampling event.

Table 6-3
Summary of Rinsate Blank Samples Collected April 2003

Sample ID	Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives	BOD/COD
GROUNDWATER – TOTAL FRACTION						
RB01T-GRW (WAT087C)	X	X	X	X	X	---
RB02T-GRW (WAT087C)	X	X	X	X	X	---
RB03T-GRW (WAT087C)	X	X	---	---	X	---

Table 6-3
Summary of Rinsate Blank Samples Collected April 2003

Sample ID	Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives	BOD/COD
RB04T-GRW (WAT080C)	X	X	---	---	X	---
RB05T-GRW (WAT080C)	X	X	---	---	X	---
RB06T-GRW (WAT078C)	X	---	---	---	---	---
RB07T-GRW (WAT078C)	X	X	---	---	---	---
RB08T-GRW (WAT078C)	X	X	---	---	---	---
Frequency:	6.4	5.6	7.7	8.0	10.6	---
GROUNDWATER –DISSOLVED FRACTION						
RB03D-GRW	X	---	---	---	---	---
RB04D-GRW (WAT080C)	X	---	---	---	---	---
RB07D-GRW (WAT078C)	X	---	---	---	---	---
RB08D-GRW (WAT078C)	X	---	---	---	---	---
Frequency:	3.2	0	0	0	0	---
SURFACE WATER –TOTAL FRACTION						
RB01T-SFW (WAT065C)	X	X	---	---	---	X
Frequency:	5.3	5.3	---	---	---	5.9

Table 6-4 summarizes the analytes detected in the associated RI/FS rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered.

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results less than the calculated criteria concentration. In determining the average concentrations, for nondetect values, one half the RL was used to represent the contributing concentration, as opposed to zero, which could potentially bias the average concentration low. Despite the fact that some results were qualified as nondetect on the basis of rinsate blank detections, the rinsate blank results are generally indicative of acceptable decontamination procedures as detections were infrequent and at low levels.

6.3 FIELD BLANK RESULTS

The analyses of organic parameters require field blanks to assure appropriate quality control. The field blank results are utilized to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Table 6-5 summarizes the field blank samples that were collected with the organic samples in this data package. The required QC frequency of 5% was attained. Chloroform was the only analyte detected in any of the field blank samples. Table 6-6 summarizes the samples in which this parameter was reported, as well as the average concentration, and criteria number calculated in the assessment of qualification as nondetect of this analyte in organic sample results.

Table 6-4
Summary of Rinsate Blank Results and Additional Qualifications

Analytes	RL	# Detections	Total # Samples	% Detections	Average Conc. (mg/L)	x5 Criteria (mg/L)	Range for Field Samples (mg/L)	Action
GROUNDWATER- TOTAL FRACTION								
Ammonia	0.04	8	8	100	0.097	0.48	0.016-2.9	Detected ammonia results ≤ 0.48 → U RB-I
Bicarbonate (as $CaCO_3$)	2.2	8	8	100	2.7	13.5	1-744	Detected bicarbonate results ≤ 13.5→ U RB-I
Chloride	0.4	2	8	25	0.61	3.1	0.4-242	Detected chloride results ≤ 3.1→ U RB-I
Chloroform (µg/L)	10	1	2	50	3.5	18	10-220	Detected chloroform results ≤ 18→ U RB-I
Chromium	1	1	8	12.5	0.54	2.7	0.9-582	Detected chromium results ≤ 2.7 → U RB-I
Molybdenum	1.6	1	8	12.5	1.1	5.4	1.6-6470	Detected molybdenum results ≤ 5.4→ U RB-I
Nitrate	0.4	1	8	12.5	0.25	1.2	0.2-64.1	Detected nitrate results ≤ 1.2→ U RB-I
Phosphate, Ortho As P	0.01	4	8	50	0.55	2.7	0.01-16.6	Detected orthophos. results ≤ 2.7→ U RB-I
Total Alkalinity	1	8	8	100	2.8	13	1-744	Detected total alk. results ≤ 13 → U RB-I
Total Dissolved Solids	10	8	8	100	51	254	136-21300	Detected TDS results ≤ 254→ U RB-I
Total Organic Carbon	1	1	8	12.5	0.65	3.3	1-62.2	Detected TOC results ≤ 3.3→ U RB-I
Total Suspended Solids	0.5	4	8	50	3.2	16	0.5-10300	Detected TSS results ≤ 16→ U RB-I
GROUNDWATER- DISSOLVED FRACTION								
Chromium	1	2	4	100	0.85	4.25	0.9-499	Detected chromium results ≤ 4.25→ U RB-I
SURFACE WATER- TOTAL FRACTION								
Ammonia	0.04	1	4	100	0.16	0.80	0.04-0.36	None
Bicarbonate (as CaCO3)	1	1	4	100	2.8	14	36.1-73	Detected bicarbonate results ≤ 14→ U RB-I
Chemical Oxygen Demand	20	1	4	100	40	200	20-35.6	None
Total Alkalinity	1	1	4	100	2.8	14	36.1-73	Detected total alk. results ≤ 14→ U RB-I
Total Dissolved Solids	10	4	4	100	27	135	27-176	Detected TDS results ≤ 135→ U RB-I
Total Suspended Solids	0.5	1	4	100	0.33	1.7	7.7-48	Detected TSS results ≤ 1.7→ U RB-I

Table 6-5
Summary of Field Blank Samples Collected April 2003

Sample ID	Volatile Organics	Semivolatile Organics	Explosives
GROUNDWATER –TOTAL FRACTION			
FB01T-GRW (WAT084A)	X	X	---
FB02T-GRW (WAT078C)	X	X	---
FB03T-GRW (WAT087C)	---	---	X
FB04T-GRW (WAT079C)	---	---	X
FB05T-GRW (WAT085A)	---	---	X
Frequency:	7.7	7.7	6.4

Table 6-6
Summary of Field Blank Results and Additional Qualifications

Field Blank ID	Compound	Avg. Conc. (µg/L)	x5 Criteria (µg/L)	Range for Field Samples (µg/L)	Action
FB01T-GRW FB02T-GRW	Chloroform	3.0	15.0	10-220	Detected chloroform results ≤ 15.0→ U RB-I

Qualification was not necessary as there were no chloroform detections in field samples. The field blank results indicate that no contamination of field samples were due to ambient field conditions.

6.4 TRIP BLANK RESULTS

A trip blank accompanied each cooler of VOC samples to the sampling site, was handled like an environmental sample, and returned to the laboratory for analysis. Trip blank results were used to assess the potential introduction of contaminants from sample containers or during the transportation/storage procedures. As all trip blank samples associated with the organic samples in the April 2003 sampling event were nondetect, the possibility of contamination from the above mentioned sources was unlikely.

With the exception of two cyanide results, all data were considered acceptable for use in meeting project objectives as qualified. Multiple sample results were qualified as nondetect on the basis of laboratory blank or rinsate blank contamination. Others were qualified as estimated on the basis of matrix spike, LCS, or surrogate recoveries. Lastly, several data results were qualified as estimated on the basis of holding time exceedances, serial dilution results, laboratory/field duplicate disagreements, total versus partial disagreements, anion/cation imbalances, or calibration results (for organics). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives.

7.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 7-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 7-1
Summary of Precision Assessment for April 2003

Analysis Type	QC Measure	# of Measurements	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	FD	152	151	99.3
	LD	152	152	100
Total Metals	FD	200	200	100
	LD	200	200	100
Dissolved Metals	FD	200	200	100
	LD	200	200	100
Volatile Organics	FD	86	86	100
	MS/MSD	10	10	100
Semivolatile Organcis	FD	124	124	100
	MS/MSD	18	18	100
Explosives	FD	20	20	100
	MS/MSD	20	20	100
SURFACE WATER				
Inorganics	FD	18	18	100
	LD	18	18	100
Total Metal	FD	25	25	100
	LD	25	25	100
Dissolved Metals	FD	25	25	100
	LD	25	25	100
BOD_5/COD	FD	2	2	100
	LD	2	2	100

The percentage of acceptable precision measurements was 100% for all parameters, with the exception of inorganics for groundwater, for which 87.5% of the field duplicate analyses were within acceptable limits. The overall level of precision demonstrated for all analyses collectively was considered to be acceptable.

7.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. These measurements were expressed as percent recoveries for matrix spike (MS), summarized in Table 7-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters. The only analyte, which was systematically reviewed and accordingly qualified on the basis of low LCS recoveries, was PYX. Of the data packages comprising the April 2003 Groundwater and Surface Water Sampling Event, 59.3% of the PYX results were qualified as estimated (J/UJ) with a low bias direction.

Table 7-2
Summary of Accuracy Assessment for April 2003

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	MS	96	87	90.6
Metals	MS	328	299	91.2
Volatile Organics	MS/MSD	20	20	100
Semivolatile Organics	MS/MSD	36	36	100
Explosives	MS/MSD	40	37	92.5
SURFACE WATER				
Inorganics	MS	12	9	75
Metals	MS	41	41	100

The percentage of acceptable accuracy measurements ranged from 75-100%. The lowest percentage (75%) was calculated from one matrix spike sample used to represent the accuracy of the analyses with respect to the site-specific surface water matrix spike interferences. No qualifications were issued collectively for any analytes in surface water samples other than the parent sample, which demonstrated poor matrix recoveries for three analytes. One matrix recovery was not considered adequate in assessing the matrix effect on that analyte for all surface water samples. One of these analytes, ammonia was marginally below the acceptance range, with a reported recovery of 74.2%. The remaining analyses for both groundwaters and surface waters calculated an acceptable range of accuracy measurements from 85-100%. As such, the overall level of accuracy with respect to the site matrix demonstrated for all analyses collectively was considered to be acceptable.

7.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results were considered usable as qualified for meeting project objectives, with the exception of the two cyanide results (samples GWW-1-T01N-GRW and P-2-T01N-GRW), which were rejected on the basis of extremely low matrix recoveries. As such, the analytical completeness attained is 99.5% was calculated to represent the completeness of samples, which satisfied the QAPP completeness goal of 80%.

7.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the groundwater and surface water samples collected during the April 2003 sampling event. The general close agreement between the field duplicate results, as discussed in Section 7.1, indicated that the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 5.2 indicated that sample processing and subsampling procedures were acceptable.

7.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

7.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analytes. Where possible, the laboratory submitted data from lesser dilutions (for organic analyses), thereby achieving detection limits for non-detects, as specified in the QAPP. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize

matrix interferences for certain metals. While it is anticipated that all non-rejected data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT064A

Sampling Event: April 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **Yes**

LP Reviewer: Brian Olmsted

Date Completed: 1/30/04

Data Reviewer: Karen Kronoveter

Date Completed: 06/25/03

Peer Reviewer: Alan Roberts

Date Completed: 07/09/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	PH	Conductivity	Explosives
MMW-33A-T01N-GRW	SA	521485	MMW33AT01NGR	W	X	X			X	X	X
MMW-33A-D01N-GRW	SA	521486		W	X						
MMW-10A-T01N-GRW	SA	521487	MMW10AT01N	W	X	X			X	X	X
MMW-10A-D01N-GRW	SA	521488		W	X						
MMW-29A-T01N-GRW	SA	521489	MMW29AT01NGR	W	X	X			X	X	X
MMW-29A-D01N-GRW	SA	521490		W	X						
GWW-2-T01N-GRW	SA	521491		W	X	X			X	X	
GWW-2-D01N-GRW	SA	521492		W	X						
GWW-3-T01N-GRW	SA	521493		W	X	X			X	X	
GWW-3-D01N-GRW	SA	521494		W	X						
MMW-49A-T01N-GRW	SA	521495		W	X	X			X	X	
MMW-49A-D01N-GRW	SA	521496		W	X						
SPRING39PUMP-T01N-GRW	SA	521499	SPRING39PUMP-T01N-G	W	X	X			X	X	
SPRING39PUMP-D01N-GRW	SA	521500		W	X						
MMW-28A-T01N-GRW	SA	521501	MMW28AT01NGRW MMW28AT01NGR	W	X	X	X	X	X	X	
MMW-28A-D01N-GRW	SA	521502		W	X						
GWW-1-T01N-GRW	SA	521503		W	X	X			X	X	
GWW-1-D01N-GRW	SA	521504		W	X						
TB173-GRW	TB	521505		W			X				

Matrix: S = Solid W = Water B = Biota FB = Field Blank

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The laboratory case narrative noted the replicate analysis for TDS associated with sample GWW-1-T-1N-GRW was inadvertently not performed. This was discovered during the data review process, after holding time had expired. Per instruction from URS, the replicate analysis was not run.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile organic holding blank was carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and labeled HBW064A. All results for HBW044 were nondetect, as such; it is unlikely that any cross-contamination resulted from sample storage.

The laboratory noted manual integration was employed in deriving results for the semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified on the quantitation reports. Included in the data package were the extracted ion current profiles.

The laboratory case narrative noted the nitroaromatic analysis of the blank spike sample O8LCS yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded a recovery of 65%. The laboratory has not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ), with a low bias direction.

The original nitroaromatics analysis of sample MMW-10A-T01N-GRW yielded a percent recovery of the surrogate monitoring compound 1,2-Dinitrobenzene that was well below control criteria. This sample was re-extracted beyond the holding time of seven days and re-analyzed yielding acceptable results. The nitroaromatic results presented for this sample were the re-analyses. All five target analytes for this sample were qualified as estimated (UJ) on the basis of holding time, with an indeterminate direction of bias.

Via a letter from Stacey Coker (URS) to Don Dawicki (STL) dated 04/09/03, the analyses for samples SPRING13PUMP-T/D01N-SFW (sampled on 04/01/03) were canceled due to a malfunction in the system and the pump. Samples collected from this location were not considered representative of the system. Replacement samples were collected on 04/10/03 and included with data delivery group WAT090A.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory log-in sheet noted that sample MMW-10A-T01N-GRW was not listed on the chain of custody form for explosive analysis. A bottle for explosives analysis was received and logged in for explosives analysis.
Holding Times	No	The 48-hour holding times for nitrate, nitrite, and orthophosphate were exceeded by several hours for all samples in this data package. Accordingly, the results for all nitrate, nitrite, and orthophosphate analyses were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of conductivity and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 10 days after sampling and eight days beyond log-in. The pH for all samples was measured approximately eight hours after log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Chloride was detected at a concentration of 0.23 mg/L in the inorganics method blank sample BLKIC0423A run on 04/23/03. The chloride analysis in sample SPRING39PUMP-T01N-GRW was run on 04/02/03 and was therefore associated with this blank. However, due to the fact that the reported chloride concentration was greater than 5x the chloride concentration detected in the blank, no qualification of data was considered necessary. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKE4. TICs in method blanks are not considered to be reportable as TICs for samples and such results were flagged as unusable (R). The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC • MS/MSD GGW-1-T01N-GRWMS GGW-1-D01N-GRWMS • PDS GGW-1-T01N-GRWA GGW-1-D01N-GRWA • LD GGW-1-T01N-GRWREP GGW-1-D01N-GRWREP	No	The inorganics analysis of the matrix spike associated with sample GWW-1-T01N-GRW yielded percent recoveries for bicarbonate alkalinity (0.73%), total alkalinity (21.9%), and total organic carbon (159.7%) that were outside the established control limits of 75-125%. The majority of metal analytes were recovered outside the control limit of 75-125% for the matrix spike analyses of samples GGW-1-T01N-GRW and GGW-1-D01N-GRW. In both samples, the analyte concentrations of aluminum, iron, manganese, and zinc were greater than 4x the spike concentrations and consequently were considered inappropriate for assessing accuracy for sample specific matrix affects. There were several instances in which the reporting limits for various metal analytes were increased due to dilution factors, which affected the reliable quantitation of several spiked metals. As noted in Table 1.3, it was therefore considered inappropriate for assessing accuracy for sample specific matrix affects for cadmium, chromium, cobalt, iron, nickel, and selenium. In the case of cadmium and iron, the instrument detection limit was greater than the amount of spike added. For the remaining analytes, the difference between the spike level and the RL (adjusted for dilution) was ≤ 1x the RL. Post digestion spikes were performed on the metal analytes that did not meet the specified criterion for the initial matrix spike recoveries. All post digestion spike recoveries for these analytes were within acceptance limits.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		Table 1.3 summarizes the inorganic and metal analytes recovered outside the limits, with the associated percent recoveries and any qualification codes assigned to the parent samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) GWW-1-T01N-GRW GWW-1-D01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery of surrogate compound Phenol-d5 in the semivolatile analysis of sample E4LCS was 112%, outside the acceptance range limit of 10-110%. No qualification of associated data was necessary due to the fact that 3 of 4 remaining acid fraction surrogate recoveries were within acceptable ranges. The surrogate recovery of surrogate compound Terphenyl-d14 in the semivolatile analysis of sample E4LCS was 150%, outside the acceptance range limit of 33-141%. No qualification of associated data was necessary due to the fact that 3 of the four remaining base/neutral fraction surrogate recoveries were within acceptable ranges. The water explosives surrogate recoveries of S1 (1,2-Dinitrobenzene) for two samples were outside of the acceptable criteria recovery range of 85-116%. Sample MMW-33A-T01N-GRW recovered the surrogate on the first column at 82%, with an acceptable recovery on the second column. Sample MMW-10-T01N-GRW recovered the surrogate at 62% on the first column and 64% on the confirmation column. All target analytes for both samples were qualified as estimated (UJ) with a potentially low bias direction. The serial dilution analyses on samples GWW-1-T01N-GRW and GWW-1-D01N-GRW were only applicable to manganese, as none of the other initial sample results were sufficiently larger (50x) than the IDL, (adjusted for dilution). The percent difference between the sample result and its 5-fold dilution was compared to an evaluation criterion of ±10%. Both reported percent differences for GWW-1-T01N-GRW (9.9%) and GWW-1-D01N-GRW (5.9%) were less than 10%, and consequently qualification of any results on the basis of serial dilutions was not considered necessary. The orthophosphate concentration of 0.053 mg/L in sample GWW-2-T01N-GRW was greater than the corresponding total phosphorus concentration of 0.031 mg/L. Due to the fact that both concentrations were not significantly larger (5x) than the RL (0.010), the absolute difference between the two results was compared to an evaluation criterion of ±2x RL. Accordingly, the orthophosphate and phosphorus results for sample GWW-2-T01N-GRW was qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exception of MMW-28A-T/D01N-GRW, which reported a 19.01% balance, which agrees with the recalculated cation/anion balance of 19.16%. Four of the cation concentrations contributing to the calculation of this balance (Mg^{2+}, K^{+}, Na^{+}, and Al^{3+}) were not detected above the instrument detection limit (IDL) and were therefore reported at the detection limit. Recalculation of the balance, using ½ the concentration for Na+, which contributed significantly to this balance (25%meq/L), resulted in a cation/anion balance of 12.43%. Recalculation of the balance using 75% of the reporting limits for the four above mentioned cations, resulted in a cation/anion balance of 12.04%. The concentrations were low enough that reporting limits controlled the calculations. The balances were therefore not an appropriate measure of accuracy. No qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank TB173-GRW	N/A	All results for TB-173-GRW were nondetect. The Field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Detected organic analytes with concentrations between the MDL and RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Upon review of the summary forms, it was noted that there were several semivolatile organic compounds recovered above the QC limits, indicating a potential high bias in the reporting of these analyte results. No target analytes were detected in any of the associated field samples and therefore qualification was not necessary.
Initial Calibration	No	Table 1.5 summarizes the initial calibration results for volatile organics that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues.
Initial/Continuing Calibration Verification	No	Table 1.6 and 1.7 summarizes the continuing calibration detections and the resultant data qualifications. In addition, four SVOC ICV method spike recoveries were below QC limits. Table 1.8 summaries the results.
Laboratory Control Sample Results	No	5 of 9 analytes analyzed for the SVOC LCS and LCSD displayed percent recoveries exceeding QC limits. No qualification was performed because analyte sample results were non-detect. Qualification based on explosives LCS and LCSD values outside control limits was performed during sample-specific validation, refer to method QC section. Water explosives LCS sample M5LCS displayed a LCS and LCSD percent recovery for PETN of 74% and 76%, respectively. The QC limits for PETN are 75-110%. No qualification was performed because the LSCD percent recovery was within limits.
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH
MMW-33A-T01N-GRW	3.5 J	0.0050 UJ	0.014 J	1650 J	4.4 J
MMW-10A-T01N-GRW	4.6 J	0.0050 UJ	0.028 J	1960 J	4.4 J
MMW-29A-T01N-GRW	4.2 J	0.0050 UJ	0.016 J	1480 J	4.7 J
GWW-2-T01N-GRW	3.9 J	0.0050 UJ	0.053 J	1940 J	4.4 J
GWW-3-T01N-GRW	3.5 J	0.0050 UJ	0.030 J	1740 J	4.5 J
MMW-49A-T01N-GRW	3.8 J	0.0050 UJ	0.032 J	1760 J	4.5 J
SPRING39PUMP-T01N-GRW	1.8 J	0.0050 UJ	0.010 UJ	1230 J	4.8 J
MMW-28-T01N-GRW	0.73 J	0.0050 UJ	0.010 UJ	810 J	6.1 J
GWW-1-T01N-GRW	4.2 J	0.0050 UJ	0.018 J	1600 J	4.9 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	---	---	---	---	-42.7	---	42.6	None of the samples were associated with CCB5	---
Beryllium (P)	0.3	1.0	1.2	2.0	2.2	0.335	0.3	All samples	U CCB-I or U MB,CCB-I
Cadmium (P)	---	0.9	---	---	---	---	0.7	GWW-2-T01N-GRW GWW-2-D01N-GRW GGW-3-T01N-GRW MMW-10A-D01N-GRW MMW-10A-T01N-GRW MMW-29A-D01N-GRW MMW-29A-T01N-GRW MMW-33A-D01N-GRW MMW-49A-D01N-GRW MMW-49A-T01N-GRW	U CCB-I
Chromium (P)	-2.1	---	---	---	---	---	1.9	GWW-2-D01N-GRW GWW-2-T01N-GRW MMW-10A-D01N-GRW MMW-10A-T01N-GRW MMW-29A-D01N-GRW MMW-29A-T01N-GRW MMW-33A-D01N-GRW MMW-33A-T01N-GRW	UJ CCB-L
Manganese (P)	---	---	---	1.4	---	1.362	1.3	MMW-28A-T01N-GRW	U MB-I
Selenium (MS)	0.7	0.8	0.6	1.4	--	3.656	0.50	All samples with the **exception** of: GWW-1-D01N-GRW GWW-3-T01N-GRW MMW-10A-T01N-GRW MMW-28A-D01N-GRW MMW-29A-T01N-GRW	U CCB-I or U MB,CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	% MS	PDS %R	Criteria	RL* (µg/L)	Recalc %MS **	Comment	Action
GWW-1-T01N-GRW (A)							
Bicarbonate Alkalinity	0.73	N/A	75-125%	1.0 mg/L	N/A	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery	NQ
Total Alkalinity	21.9	N/A		1.0 mg/L			
Total Organic Carbon	159.7	N/A		1.0 mg/L		None	1.5 J MS-H
Aluminum	27.0	96.4	75-125%	4260.0	N/A	N/A: [analyte] >4x [spike]	NQ
Antimony	141.5	82.9		72.00	127.1	Recalculated MS % still above upper limit	NQ (ND)
Arsenic	162.2	86.6		40.00	62.18	Spike diluted to near detection limit IDL ≥ [spike] (40.00 µg/L)	NQ (ND)
Barium	134.4	79.2		123.0	128.3	Recalculated MS % still above upper limit	NQ (ND)
Beryllium	136.9	78.5		3.000	N/A	None	NQ(ND)
Boron	139.1	92.2		84.00	122.3	Spike diluted to near detection limit	NQ (ND)
Cadmium	151.7	96.4		70.00	11.68	Spike diluted to near detection limit IDL ≥ [spike] (50.00 µg/L)	NQ (ND)
Chromium	0.0	96.2		190.0	N/A	Difference between RL and [spike] (200.0 µg/L) < 1xRL	NQ
Cobalt	125.3	97.2		360.0	53.34	Spike diluted to near detection limit Difference between RL and [spike] (500.0 µg/L) < 1xRL	NQ (ND)
Iron	0.0	96.3		4220.0	N/A	IDL ≥ [spike] (1000.0 µg/L)	NQ
Manganese	-96.0	96.2		130.0	N/A	IDL ≥ [spike] (500.0 µg/L)	NQ
Molybdenum	128.3	80.7		23.00	123.7	Spike diluted to near detection limit	NQ (ND)
Nickel	186.5	97.3		730.0	40.50	Spike diluted to near detection limit IDL ≥ [spike] (500.0 µg/L)	NQ (ND)
Silver	127.7	101.0		1.000	117.7	Spike diluted to near detection limit	NQ (ND)
Zinc	39.0	93.7		390.0	N/A	N/A: [analyte] >4x [spike]	NQ
Cyanide	15.9	116.8		10.00	N/A	None	10.0 U R (unusable)
GWW-1-D01N-GRW (A)							
Aluminum	138	96.4	75-125%	4260.0	N/A	N/A: [analyte] >4x [spike]	NQ
Antimony	129.9	82.9		72.00	115.5	Spike diluted to near detection limit	NQ (ND)
Barium	134.6	79.2		123.0	128.5	Recalculated MS % still above upper limit	NQ (ND)
Beryllium	134.0	78.5		3.000	N/A	None	NQ (ND)
Boron	143.2	92.2		84.00	126.4	Recalculated MS % still above upper limit	NQ (ND)
Chromium	0.0	96.2		190.0	N/A	Difference between RL (190.0 µg/L) and spike added (200.0 µg/L) is less than RL	NQ
Cobalt	126.8	97.2		360.0	54.76	Spike diluted to near detection limit Difference between RL and [spike] (500.0 µg/L) < 1xRL	NQ (ND)
Copper	73.4	95.6		200.0	N/A	None	480 J MS-L
Iron	0.0	96.3		4220.0	N/A	ND and RL > [spike] IDL ≥ [spike] (1000.0 µg/L)	NQ
Lead	127.1	101.4		1.000	N/A	None	4.3 J MS-H
Molybdenum	134.3	80.7		23.00	129.7	Recalculated MS % still above upper limit	NQ (ND)
Selenium	166.9	86.8		5.000	116.9	Spike diluted to near detection limit	NQ (parent sample is UJ)
Nickel	191.2	97.3		730.0	45.18	Spike diluted to near detection limit IDL ≥ [spike] (500.0 µg/L)	NQ (ND)

N/A = Not Appropriate (Post digestion spike or no recalculation for MS %R required for qualitative analysis)

NQ = No Qualification

NQ (ND) = No Qualification due a nondetect of the analyte in the parent sample (potential high bias in MS does not affect the quality of nondetect results)

RL = Reporting limit (IDL adjusted for dilution) *units in µg/L, unless otherwise stated

IDL = Instrument detection limit

Recal %MS** = Recalculated Matrix Spike recovery using the RL instead of 0 for nondetect results

Table 1.4
Laboratory Duplicate Results
Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Evaluation Criterion	Qualification Of Parent Sample
GWW-1-T01N-GRW	Aluminum	2270 > 200	38800 J D-I
	Cadmium	23.8 > 5	70.0 UJ D-I
	Manganese	1150 > 15	20500 J D-I
	Selenium	10.6 > 2	15.7 UJ D-I
	Zinc	323 > 20	6020 J D-I
GWW-1-D01N-GRW	Cadmium	23.37 > 5	93.4 J D-I
	Selenium	11.05 > 2	5.0 UJ D-I
	Zinc	27 > 20	5820 J D-I

Table 1.5
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	ICAL Date/Time	Analyte	% RSD >30%	Samples Qualified	Qualification and Qualification Codes
VOC	04/07/03 (1234)	2-Hexanone	50.0	MMW-28-A-T01N-GRW TB173-GRW	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.6
Continuing Calibration Verification Resulting in Qualification

Analyte	CCV4 %R	Samples Qualified	Qualification Codes
Selenium (MS)	85.3	GWW1-T01N-GRW GWW1-D01N-GRW	J/UJ CCV-L

MS=ICP-MS CCVx-Continuing Calibration Verification

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.7
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	% RSD >25%	Samples Qualified	Qualification Codes
SVOC	04/15/03 (0751)	2,4-Dinitrophenol	26.7	MMW-28-A-T01N-GRW	UJ CCAL-I
		3,3'-Dichlorobenzidine	34.4		

CCAL = Continiung Calibration RSD = Percent relative standard deviation

Table 1.8
Initial Calibration Verification Results For Method Spike Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	Analyte	% Recovery	QC Limits	Qualification Codes
SVOC	2,4-Dimethylphenol	64.42	75-125	UJ ICV-L
	3-Nitroaniline	66.06		
	2,4-Dinitrophenol	66.72		
	4-Nitrophenol	71.38		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT065C Sampling Event: April 2003

Matrix: Solid __Water _X_Biota ___

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Ansley Watson Date Completed: 04/27/03

Peer Reviewer: Alan Roberts Date Completed: 04/28/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses		
					Metals	Inorganics	BOD/COD
RR-US-SPRING13-T01N-SFW	SA	521544	RR-US-SPRG13-T01N-SF and RR-US-SPRG13-T01N-GRW	W	X	X	X
RR-US-SPRING13-D01N-SFW	SA	521545	RR-US-SPRG13-D01N-SF and RR-US-SPRG13-D01N-GRW	W	X		
RR-DS-SPRING13-T01N-SFW	SA	521546	RR-DS-SPRG13-T01N-SF and RR-DS-SPRG13-T01N-GRW	W	X	X	X
RR-DS-SPRING13-D01N-SFW	TB	521547	RR-DS-SPRG13-D01N-SF and RR-DS-SPRG13-D01N-GRW	W	X		
RR-US-SPRING39-T01N-SFW	SA	521548	RR-US-SPRG39-T01N-SF and RR-US-SPRG39-T01N-GRW	W	X	X	X
RR-US-SPRING39-D01N-SFW	SA	521549	RR-US-SPRG39-D01N-SF and RR-US-SPRG39-D01N-GRW	W	X		
RR-DS-SPRING39-T01N-SFW	SA	521550	RR-DS-SPRG39-T01N-SF and RR-DS-SPRG39-T01N-GRW	W	X	X	X
RR-DS-SPRING39-D01N-SFW	SA	521551	RR-DS-SPRG39-T01N-SF and RR-DS-SPRG39-T01N-GRW	W	X		
RB01T-SFW	RB	521552		W	X	X	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

Selected surface water samples reported in this package were reanalyzed for dissolved aluminum, dissolved arsenic, and dissolved cadmium without dilution in order to achieve lower reporting limits to meet project objectives. The results for the re-analysis for this package were reported in three data package WATRAS4. Each package was reviewed in accordance with SOP 12.1. The results for the re-analysis have been annotated to indicate which results were selected for reporting.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	There were three remarks noted in the sample receipt form. • Samples RR-US-SPRING13-T01N/D01N-SFW and RR-DS-SPRING13-T01N/D01N-SFW were cancelled as requested by the client. • For samples RR-US-SPRING39-T01N/D01N-SFWand RR-DS-SPRING39-T01N/D01N-SFW, the T01N and D01N were inadvertently omitted on the COC. The laboratory was contacted and the correction was made so that the sample was logged in with the correct field ID. • For sample RB01T-SFW, the COC was accidentally not marked for inorganic analysis. The laboratory was contacted and the inorganic methods were run on this sample.
Holding Times	Yes	The 48-hour holding time were exceeded by less than 24 hours for nitrate as N, nitrite as N, orthophosphate, and BOD. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Antimony, and beryllium were detected in various blanks. Table 1.2 summarizes the blank detections associated with samples in this SDG and the resultant data qualifications. In results qualified for positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Not Applicable	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogate • Serial Dilution RR-US-SPRG39-T01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample RR-US-SPRG39-T01N-SFW, pH class C, was applicable for 0 out of 24 analytes.
Field QC Rinsate Blank • RB01T-SFW (4/1/03) Field Blank Trip Blank	No	There were a few detections in the rinsate blank (RB). These are summarized in Table 1.3. The RB results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. The reporting limit (RLs) in the nitrate for sample RR-US-SPRG39-T01N-SFW and RR-DS-SPRG30-T01N-SFW were elevated slightly because the original analyses yielded peaks with an area counts below those of the low point of the calibration curve.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the laboratory performance reviews, the following additional parameters were evaluated: Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)	BOD (mg/L)	Conductivity (umhos/cm)	pH
RR-US-SPRG39-T01N-GRW	1.0 UJ	0.005 UJ	0.01 UJ	1.5 UJ	305 J	7.4 J
RR-DS-SPRG39-T01N-GRW	1.1 UJ	0.005 UJ	0.01 UJ	1.5 UJ	337 J	7.4 J
RB01T-GRW	0.4 UJ	0.005 UJ	0.01 UJ	1.5 UJ	0.050 J	6.9 J

Table 1.2
Method Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS) DF=2		1.5	1.2		0.3	RR-US-SPRG39-T01N-SFW	U CCB-I
Beryllium (P) DF=1	0.5	0.8		0.915	0.3	RR-DS-SPRG39-T01N-GRW, RR-DS-SPRG39-D01N-GRW, RR-US-SPRG39-T01N-GRW, RR-US-SPRG39-D01N-GRW, RB01T-SFW	U MB, CCB-I

MS=ICP-MS P=ICP DF=Dilution Factor CCBx-Continuing Calibration Blank
MB=Method Blank IDL= Instrument Detection Limit
Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

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Table 1.3
Rinsate Blank Detections

	RB01T-SFW
Conductivity	0.05
TDS	30.0
TSS	0.58
Bicarbonate Alkalinity	2.8
Total Alkalinity	2.8
Ammonia	0.16
COD	39.9
PH	6.9

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT066C

Sampling Event: Spring 2003 Groundwater

Matrix: Solid ___Water _X_Biota ___

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Karen Kronoveter

Date Completed: 05/12/03

Peer Reviewer: Alan Roberts

Date Completed: 05/20/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses					
					Metals	Inorganics	VOCs	SVOCs	PH	Conductivity
MW-7C-T01N-GRW	SA	521572		W	X	X			X	X
MW-7C-D01N-GRW	SA	521573		W	X					
EW-5C-T01N-GRW	SA	521574		W	X	X			X	X
EW-5C-D01N-GRW	SA	521575		W	X					
EW-5D-T01N-GRW	SA	521576		W	X	X			X	X
EW-5D-D01N-GRW	SA	521577		W	X					
MW-CH-T01N-GRW	SA	521578	MWCHT01NGRW	W	X	X	X	X	X	X
MW-CH-D01N-GRW	SA	521579		W	X					
EW-4-T01N-GRW	SA	521580		W	X	X			X	X
EW-4-D01N-GRW	SA	521581		W	X					
EW-4-T01D-GRW	FD	521582		W	X	X			X	X
EW-4-D01D-GRW	FD	521583		W	X					
EW-5A-T01N-GRW	SA	521584		W	X	X			X	X
EW-5A-D01N-GRW	SA	521585		W	X					
EW-5B-T01N-GRW	SA	521586		W	X	X			X	X
EW-5B-D01N-GRW	SA	521587		W	X					
EW-2-T01N-GRW	SA	521588		W	X	X			X	X
EW-2-D01N-GRW	SA	521589		W	X					
EW-3-T01N-GRW	SA	521590		W	X	X			X	X
EW-3-D01N-GRW	SA	521591		W	X					
TB179-GRW	TB	521592		W			X			

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The case narrative from the laboratory noted the incorrect sample volumes were entered for the Alkalinity analyses (04/08/03) of samples EW-5A-T01N-GRW and MW-CH-T01N-GRWMS, resulting in incorrect sample results. The correct sample volumes were entered and used to recalculate the reported alkalinity results.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile organic holding blank was carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and labeled HBW066C. All results for HBW066C were nondetect, as such; it is unlikely that any cross-contamination resulted from sample storage.

The laboratory noted manual integration was employed in deriving results for the semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified on the quantitation reports. Included in the data package were the extracted ion current profiles.

The laboratory case narrative noted the TOC analyses of the initial calibration verification standard and the closing calibration verification standard yielded percent recoveries that were slightly above the established control limits. Upon review of the raw data sheets, it was verified that these standards run on 04/16/03 were recovered at 114%. However, these concentrations fell below the reporting limits specified by the QAPP and were subsequently reported. Based on the end use of the data, the potential high bias suggested by the LCS recovery of 114% is not considered to affect the usability of data.

The case narrative provided by the laboratory noted the metals analysis of the initial calibration blanks associated with the analytical sequence from 04/27/03 on instrument ICP 5, yielded a concentration of iron that exceeded the laboratory's reporting limit. The run logs verified the ICB was not associated with the data in this package. The CCBs, which were associated with the data in this package were recovered within the acceptance range. No qualification of data was therefore considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding times for nitrate, nitrite, orthophosphate, and TDS were exceeded by several hours for many samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of conductivity and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 13 days after sampling and 11 days beyond log-in. The pH for all samples was measured seven hours after log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKE4. TICs in method blanks are not considered to be reportable as TICs for samples. The multiple unknown compounds were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value. 4-Hydroxy-4-methyly-2-pentanone was tentatively identified at a concentration of 300 µg/L, with an assigned lab code of (NJA) to note the compound was a suspected aldol condensation product of acetone. The identification of this TIC in sample MW-CH-T01N-GRW was rejected due to its presence in the associated blank. No qualification of organic data (volatile or semivolatile) was necessary on the basis of method blank detections.
Matrix QC • MS/MSD MW-CH-T01N-GRWMS MW-CH-T01N-GRWMSD MW-CH-D01N-GRWMS • PDS • LD MW-CH-T01N-GRWREP MW-CH-D01N-GRWREP	No	Sample MW-CH-T01N-GRWMS failed to recover any bicarbonate alkalinity spike. The sulfate matrix spike for the same sample yielded as percent recovery of 62.8% that was outside the control limits of 75-125%. Accordingly, both bicarbonate alkalinity and sulfate results were qualified as estimated (J) with a low bias direction for the parent sample. The metals analysis of the matrix spike associated with sample MW-CH-T01N-GRW yielded percent recoveries for iron (145.2%) and zinc (60.2%) that were outside the established control limits of 75-125%. The iron matrix spike recovery was above the upper limit of the acceptance range, suggesting a potential high bias. Due to the fact that iron was not detected in the parent sample (MW-CH-T01N), no qualification of the result was necessary. The zinc matrix spike recovery was below the lower limit of the acceptance range but ≥30%, suggesting a potential low bias in the sample results. Zinc was detected at 1090 µg/L and was consequently qualified as estimated with a potential low bias. The laboratory duplicate analysis resulted in the qualification of zinc in the parent sample (MW-CH-T01N-GRW) as estimated (J). Sample MW-CH-T01N-GRW reported a concentration of 1094.0 µg/L and its duplicate (MW-CH-T01N-GRWREP) reported a zinc concentration of 886.1 µg/L. The CRDL (corrected for a ten-fold dilution for zinc) established a control limit of 200 µg/L. Due to the fact that the zinc in the replicate sample was not greater than 5x 200 µg/L, the absolute difference between the two results (207.9 µg/L) was compared to an evaluation criteria of 1xCRDL (200 µg/L). Accordingly, zinc in the parent sample was qualified. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (C) MW-CH-T01N-GRWL MW-CH-D01N-GRWL • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery of surrogate compound Phenol-d5 in the semivolatile analysis of sample E4LCS was 112%, outside the acceptance range limit of 10-110%. No qualification of associated data set necessary due to the fact that 3 of 4 remaining acid fraction surrogate recoveries were within acceptance ranges. The surrogate recovery of surrogate compound Terphenyl-d14 in the semivolatile analysis of sample E4LCS was 150%, outside the acceptance range limit of 33-141%. No qualification of associated data set was necessary due to the fact that 3 of the four remaining base fraction surrogate recoveries were within acceptance ranges. The matrix spike recovery of the compound pentachlorophenol for the sample MW-CH-T01N-GRW was 89%, while its duplicate recovered the same compound at 49%, resulting in a 58% difference between the two recoveries. The QC limit for RPD for this compound is 50%. Due to the fact that there is such a large discrepancy between the recoveries in the sample and its duplicate, indicating a lack of confidence in the precision of the analysis on site-specific sample matrix, pentachlorophenol was qualified as estimated (UJ) with an indeterminate bias direction for the parent sample only. The serial dilution analyses on samples MW-CH-T01N-GRW and MW-CH-D01N-GRW were not applicable for all 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL, (adjusted for dilution). It was therefore not necessary to qualify any results on the basis of serial dilutions. The molybdenum concentration of 30.9 µg/L in the filtrate (dissolved) sample EW-5D-D01N-GRW is greater than the molybdenum concentration 14.0 µg/L in the corresponding total metals sample, EW-5D-T01N-GRW. Due to the fact that neither value is greater than 5x the RL (2.3 µg/L), the absolute difference between the two results is compared to an evaluation criterion of 2x the RL. Accordingly, the molybdenum results for both samples were qualified as estimated (J/UJ) with an indeterminate direction of bias. The orthophosphate concentration of 0.39 mg/L in sample EW-5D-T01N-GRW was greater than the corresponding phosphorus concentration of 0.031 mg/L. Due to the fact that neither partial nor total concentration exceeded 5x the RL (0.010), the absolute difference between the two results was compared to an evaluation criterion of ±2x RL. Accordingly, the orthophosphate and phosphorus results for sample EW-5D-T01N-GRW was qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion and subsequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate EW-4-T01D-GRW EW-4-D01D-GRW • Rinsate Blank • Field Blank • Trip Blank TB-179-GRW	N/A	All results for these field duplicate pairs satisfied the evaluation criteria in the QAPP. All results for TB-179-GRW were nondetect. The Field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected analytes with concentrations between the MDL and RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: VOCs/SVOCs: Initial Calibration VOCs/SVOCs: Continuing Calibration Laboratory Control Samples SVOCs: Initial Calibration Verification Table 1.3a and 1.3b summarizes the initial calibration results for volatile organics that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. The laboratory case narrative noted the semivolatile organics analyses of the blank spike samples associated with this delivery group yielded percent recoveries of select target compounds that exceeded control criteria. Upon review of the semivolatile organic lab control sample results, it was verified that there were several semivolatile organic compounds recovered above the QC limits. Due to the fact that all LCS recovered compounds were not detected in the one semivolatile sample analyzed (MW-CH-T01N-GRW), it was not considered necessary to qualify data on the basis of laboratory control standard recoveries. Table 1.4 summarizes qualifications on the basis of initial calibration verification for semivolatile analytes in all SVOC samples.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	TDS	Cond.	PH
MW-7C-T01N-GRW	---	0.0050 UJ	0.033 J	---	1630 J	7.6 J
EW-5C-T01N-GRW	---	---	0.023 J	---	1720 J	7.5 J
EW-5D-T01N-GRW	---	0.0050 UJ	0.39 J	---	1920 J	7.6 J
MW-CH-T01N-GRW	---	0.0050 UJ	0.016 J	---	465 J	7.6 J
EW-4-T01N-GRW	0.44 J	0.0050 UJ	0.036 J	970 J	1140 J	7.4 J
EW-4-T01D-GRW	0.45 J	0.0050 UJ	0.037 J	998 J	1150 J	7.6 J
EW-5A-T01N-GRW	---	0.0050 UJ	0.12 J	---	1790 J	7.6 J
EW-5B-T01N-GRW	---	0.0050 UJ	0.10 J	---	1630 J	7.5 J
EW-2-T01N-GRW	---	0.0050 UJ	0.017 J	---	442 J	7.9 J
EW-3-T01N-GRW	---	0.0050 UJ	0.015 J	---	1230 J	7.5 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	1.1	1.0	1.0	6.0	---	0.896	0.3	EW-4-T01D-GRW MW-7C-T01N-GRW	U MB, CCB-I
Beryllium (P)	---	0.6	---	---	---	0.374	0.3	EW-2-D01N-GRW EW-3-D01N-GRW EW-4-T01D-GRW EW-5B-D01N-GRW EW-5B-T01N-GRW EW-5C-D01N-GRW EW-5D-D01N-GRW EW-5D-T01N-GRW MW-7C-D01N-GRW MW-7C-T01N-GRW MW-CH-D01N-GRW MW-CH-T01N-GRW	U MB-I U MB,CCB-I
Boron (P)	---	---	---	---	---	9.309	8.4	All samples with the **exception** of: EW-2-D01N-GRW EW-2-T01N-GRW MW-CH-D01N-GRW MW-CH-T01N-GRW	U MB-I
Chromium (P)	---	1.5	1.4	---	---	1.904	1.0	All samples with the **exception** of: EW-5A-D01N-GRW	U MB-I U MB,CCB-I
Selenium (MS)	0.5	---	-0.8	---	---	---	0.5	All samples with the **exception** of: MW-CH-T01N-GRW	J CCB-L UJ CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	ICAL Date/Time	Analyte	% RSD >30%	Samples Qualified	Qualification and Qualification Codes
VOC	04/07/03 (1234)	2-Hexanone	50.0	MM-CH-T01N-GRW TB179-GRW	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.3b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date (Time)	Analyte	% D >25%	Samples Qualified	Qualification and Qualification Codes
SVOC	04/15/03 (0751)	2,4-Dinitrophenol	26.7	MM-CH-T01N-GRW	UJ CCAL-I
		3.3'-Dichlorobenzidine	34.4		

CCAL = Initial Calibration %D = Percent difference between the initial and continuing calibration RRFs

Table 1.4
Initial Calibration Verification Results For Method Spike
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	Analyte	% Recovery	QC Limits	Qualification Codes
SVOC	2,4-Dimethylphenol	64.42	75-125	UJ ICV-L
	3-Nitroaniline	66.06		
	2,4-Dinitrophenol	66.72		
	4-Nitrophenol	71.38		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT067C Sampling Event: April 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 6/13/03

Peer Reviewer: Stacey Coker Date Completed: 6/17/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganic
EW-1-T01N-GRW	SA	521564		W	X	X
EW-1-D01N-GRW	SA	521565		W	X	
EW-6 (MW-3)-T01N-GRW	SA	521566		W	X	X
EW-6 (MW-3)-D01N-GRW	SA	521567		W	X	
MW-A-T01N-GRW [3]	SA	521568		W	X	X
MW-A-D01N-GRW [3]	SA	521569		W	X	
MW-B-T01N-GRW	SA	521570		W	X	X
MW-B-D01N-GRW	SA	521571		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

[3] Additional volume submitted for matrix QC analyses.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The metals analyses in this SDG were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of samples, which were determined by the field pH determinations.

Review Parameter	CriteriaMet?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, beryllium, cadmium, iron, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS MW-A-T01N-GRW MW-A-D01N-GRW • LD MW-A-T01N-GRW MW-A-D01N-GRW	No	The matrix spike (MS) percent recovery for bicarbonate alkalinity was out of limits in sample MW-A-T01N-GRW. Table 1.3 summarizes these MS results. The MS results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of MS results per SOP 12.1.
Method QC • Surrogates • Serial Dilution MW-A-T01N-GRW MW-A-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis on samples MW-A-T01N-GRW and MW-A-D01N-GRW, both pH class C, was applicable for 1 out of 24 analytes. For samples EW-1-T01N-GRW, and MW-A-T01N/D01N-GRW the orthophosphate, or dissolved manganese, respectively, exceeded that of the total analysis of phosphorus, or manganese. Table 1.4 summarizes these results and the data qualifications issued.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Not Applicable	
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Not Applicable	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)
EW-1-T0AN-GRW	0.76 J	0.005 UJ	0.19 J
EW-6 (ME-6)-T01N-GRW	0.57 J	0.005 UJ	0.02 J
MW-A-T01N-GRW	0.40 UJ	0.005 UJ	0.013 J
MW-B-T01N-GRW	0.40 UJ	0.005 UJ	0.010 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS) DF=2	-1.8	-2.0	-1.8			-3.361	0.3	All samples in this package.	UJ MB, CCB-L
Beryllium (P) DF=1						-0.311	0.3	All samples in this package.	UJ MB-L J MB-L
Cadmium (P) DF=1					-0.7	-0.684	0.5	All samples in this package.	UJ MB, CCB-L
Iron (P) DF=10		44.3	50.0	33.9	43.2 54.2		42.2 31.1	EW-1-D01N-GRW	U CCB-I
Zinc (P) DF=10						2.850	3.9 1.4	EW-1-T01N-GRW, EW-1-D01N-GRW, EW-6-T01N-GRW, EW-6-D01N-GRW, MW-A-T01N-GRW, MW-B-T01N-GRW, MW-B-D01N-GRW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Recovery Not Meeting Criteria for Sulfate and Metals

Sample/Analytes	Matrix Spike Recovery	Acceptance Limits	Action
MW-A-T01N-GRW			
Bicarbonate Alkalinity	0.0%	75-125%	Qualify parent sample J MS-L

Table 1.4
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Absolute Difference	RL	Action
EW-1-T01N-GRW • Orthophosphate vs. Phosphorus	0.177	0.010	Results for these analytes in the EW-1-T01N-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.
Sample/Analytes	**Sample Results**	**RPD**	**Action**
MW-A-T01N-GRW • Manganese	1190 1780	39%	Results for these analytes in the MW-A-T01N/D01N-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT068C

Sampling Event: Spring 2003 SW/SED

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 05/09/03

Peer Reviewer: Alan Roberts

Date Completed: 05/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses					
					Metals	Inorganics	BOD	COD	PH	Conductivity
OUTFALL002-PIPE-T01N-SFW	SA	521671	OUTFL002PIPE-T01N-SFW	W	X	X			X	X
OUTFALL002-PIPE-D01N-SFW	SA	521672	OUTFL002PIPE-D01N-SFW	W	X					

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: No issues were noted in the case narrative section provided by the laboratory with the exception of the id sample change, which is explained in the COC, Sample receipt section.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	Based on an e-mail from Stacey Coker (URS) on 05/05/03, the sample identifier listed on the chain of custody documentation as OUTFALL002 was changed to OUTFALL002-PIPE. This change was made after the reporting forms were generated. The client identifiers were therefore corrected on the forms by hand. Due to character limitations in the laboratory's reporting software, the identifier was truncated to OUTFA002PIPE. The identifier used on the COC form was used as the field ID loaded to the database. No qualification of data was necessary on the basis of chain of custody or sample receipt.
Holding Times	No	The nitrate, nitrite, and orthophosphate analyses for sample OUTFALL002-PIPE-SFW were run several hours beyond the 48-hour holding time and were accordingly qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductivity and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for sample OUTFALL002-PIPE-SFW was taken 12 days after sampling and 10 days beyond log-in. The pH for the same sample was measured 8 hours after log-in. Therefore, the conductivity and pH results for sample OUTFALL002-PIPE-SFW were qualified as estimated (J/UJ). All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	Yes	Iron was detected in the first continuing calibration blank at a concentration of 44.6 µg/L. Antimony was detected in the first and second calibration blanks at a concentration of 0.5 µg/L and in the method prep blank at 0.339 µg/L. No qualification of data was necessary on the basis of these blanks due to the fact that both iron and antimony were not detected in the two samples in this data package.
Matrix QC • MS/MSD • PDS • LD	Yes	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) OUTFALL002-PIPE-T01N-SFWL • Total vs. Partial Analyses • Cation/Anion Balance • TDS	No	The serial dilution analysis on sample OUTFALL002-PIPE-T01N-SFW was not applicable for 22 out of 24 metal analytes. The remaining metal analytes, calcium and molybdenum, for which the dilution was applicable, did not exhibit percent deviations between the initial sample result and the 5-fold serial dilution result greater than 10%. It was therefore not necessary to qualify any data on the basis of serial dilution. The orthophosphate concentration of 0.37 mg/L in sample OUTFALL002-PIPE-T01N-SFW was greater than the corresponding total phosphorus concentration of 0.066 mg/L. Due to the fact that both values were greater than 5x the RL (0.010), the percent difference between the partial and total results was compared to an evaluation criterion of 30%. The partial concentration is 460% greater than the total concentration. Accordinly, the orthophosphate and phosphorus results for sample OUTFALL002-PIPE-T01N-SFW was qualified as estimated (J/UJ) with an indeterminate direction of bias. The ratios of the calculated versus mearsured TDS for all samples were within 0.5 and 1.5.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank		This package did not include any field quality control samples. The Field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT069C Sampling Event: Spring 2003 Surface Water

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 06/16/03

Peer Reviewer: Stacey Coker Date Completed: 06/18/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses					
				Metals	Inorganics	BOD	COD	Ph	Conductivity
DECANT-T01N-SFW	SA	521673	W	X	X	X	X	X	X
DECANT-D01N-SFW	SA	521674	W	X					

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The comments made by the laboratory were addressed in the table in its relevant section.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. The conductivity measurement for sample DECANT-T01N-SFW was taken 8 days after sampling and 6 days after log-in. The pH for the same sample was measured approximately four hours after log-in. Accordingly, the conductivity and pH results were qualified as estimated (J/UJ) with an indeterminate bias direction.
Method Blanks	No	Several metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes these blank detections. No qualification of any data was necessary due to reasons provided in the table.
Matrix QC • MS/MSD • PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) DECANT-T01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample DECANT-T01N-SFW was not applicable for 20 out of the 24 metal analytes. The four analytes, (Ca, Mn, Mo, and K) for which the dilution was applicable exhibited initial sample concentrations that were sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent deviation between the original results and its 5-fold dilution were compared to an evaluation criterion of ±10%. The percent differences for calcium (12.6%) and manganese (11.6%) were >10% and consequently resulted in the qualification of calcium and manganese results as estimated (J) with a high bias direction (due to the fact that the serial dilution result for both analytes was less than the original). The laboratory case narrative noted the metals analysis of the serial dilution associated with sample DECANT-T01N-SFW yield percent differences for calcium, magnesium, and manganese in excess of control criteria. Upon taking the dilution factor into account for the calculation of the comparison criteria, it was determined that the evaluation was not applicable for magnesium. The orthophosphate concentration of 0.054 mg/L in sample DECANT-T01N-SFW was greater than its corresponding phosphorus concentration of 0.023 mg/L. Due to the fact that both concentrations were not greater than five times the RL (0.050 mg/L), the absolute difference between the two results was compared to an evaluation criterion of ±2x RL (using the higher RL). Accordingly, the orthophosphate and phosphorus results for sample DECANT-T01N-SFW were qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. The reported cation/anion balance for sample DECANT-*01N-SFW met this criterion and consequently did not require data qualification. The ratio of the calculated versus measured TDS for the two samples in this delivery group was within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	The Field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	During the data review process, it was noted that cadmium results were reported twice for samples DECANT-T01N-SFW and DECANT-D01N-SFW, while selenium results were not reported for either sample. Upon review of the raw data sheets, it was verified that cadmium was reported from both instruments ICAP 4 and ICP-MS1. Coincidentally, the selenium results were not reported for either sample, nor were they marked off on the run log. The laboratory remedied this error and issued revised hard copy forms for the affected summary data sheets with the correct concentrations for both cadmium and selenium. The final reported concentrations were verified from the raw data sheets for ICPMS1 (05/02/03-05/03/03) for selenium and ICP 4 (04/28/03) for cadmium.

Table 1.1
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	0.5	0.5	0.4	---	---	0.339		None of the results for antimony were qualified due to the fact the results were nondetect.	---
Iron (P)	44.6	---	---	---	---	---		None of the results for iron were qualified due to the fact the results were nondetect	---
Molybdenum (P)	---	---	---	---	---	2.704		The molybdenum results were sufficiently greater than 5x the detected Mo in the method blank. No qualification necessary.	---

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT070C Sampling Event: April 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Karen Kronoveter Date Completed: 06/11/03

Peer Reviewer: Stacey Coker Date Completed: 06/17/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	pH	Conductivity
LS-1-T01N-GRW	SA	521726		W	X	X	X	X
LS-1-D01N-GRW	SA	521727		W	X			
LS-2-T01N-GRW	SA	521728		W	X	X	X	X
LS-2-D01N-GRW	SA	521729		W	X			
LS-3-T01N-GRW	SA	521730		W	X	X	X	X
LS-3-D01N-GRW	SA	521731		W	X			
US-1-T01N-GRW	SA	521732		W	X	X	X	X
US-1-D01N-GRW	SA	521733		W	X			
US-2-T01N-GRW	SA	521734		W	X	X	X	X
US-2-D01N-GRW	SA	521735		W	X			
US-3-T01N-GRW	SA	521736		W	X	X	X	X
US-3-D01N-GRW	SA	521737		W	X			

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory noted sample identifiers were abbreviated, in certain instances, to accommodate field length limitations in the data processing. Upon review of the sample ids, it was verified that all were complete and the comment by the laboratory was incorrect.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations. The laboratory noted that calcium, iron, magnesium, manganese, sodium, and zinc were reported from the full strength analysis due to the low concentration of these analytes in the field samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Several nitrate, nitrite, and orthophosphate samples were run several hours beyond the 48-hour holding time. The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 12 days after sampling and 10 days beyond log-in. The pH for all samples was measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value for positive blank results or as estimated (J/UJ) for negative blank concentrations.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (B) LS-1-T01N-GRWL Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample LS-1-T01N-GRW was not applicable for 22 out of 24 metal analytes. The initial concentrations for calcium and magnesium were sufficiently high enough, greater than a factor of 50 above the IDL, (adjusted for dilution), for the application of the serial dilution analysis. The percent differences between the original samples and their 5-fold dilutions were less than the evaluation criteria of 10% (0.4% and 1.5%, respectively). It was therefore not considered necessary to qualify any results on the basis of serial dilutions. The orthophosphate concentration of 0.23 mg/L in sample LS-1-T01N-GRWwas greater than its corresponding phosphorus concentration of 0.018 mg/L. Due to the fact that both concentrations were not greater than five times the RL (0.010 mg/L), the absolute difference between the two results was compared to an evaluation criterion of ±2x RL (using the higher RL). Accordingly, the orthophosphate and phosphorus results for sample LS-1-T01N-GRW was qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No Field QC samples were analyzed with the data in this package. The Field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho P	Conductivity	pH
LS-1-T01N-GRW	0.40 J	0.0050 UJ	0.23 J	443 J	6.7 J
LS-2-T01N-GRW	0.43 J	0.0050 UJ	0.010 UJ	435 J	6.7 J
LS-3-T01N-GRW	0.53 J	0.0050 UJ	0.010 UJ	422 J	6.8 J
US-1-T01N-GRW	0.54 J	---	0.022 J	259 J	6.5 J
US-2-T01N-GRW	0.85 J	---	---	482 J	6.8 J
US-3-T01N-GRW	0.47 J	---	---	222 J	6.9 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P)	---	---	---	---	75.0	---	50.3	US-2-T01N-GRW	U CCB-I
Antimony (MS)	0.5	0.5	0.4	0.5	---	0.339		None: all of the samples were nondetect for Sb	---
Beryllium (P)	---	-0.6	-0.4	-0.5	-0.8	-1.290	0.3	All of the samples were qualified	UJ MB,CCB-L
Chromium (P)	---	---	---	---	---	1.029	1.0	None: all of the samples were nondetect for Cr	---
Iron (P)	---	---	---	---	36.3	---	31.1	None: the three samples associated with CCB5 were all nondetect for Fe	
Selenium (MS)	---	0.9	-1.0	---	---	---	0.50	All samples with the **exception** of: LS-1-T01N-GRW	J CCB-L or UJ CCB-L
Zinc (P)	---	---	---	---	---	2.268	1.4	LS-3-D01N-GRW LS-3-T01N-GRW US-1-D01N-GRW US-1-T01N-GRW US-3-T01N-GRW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT071C Sampling Event: April 2003

Matrix: Solid ___Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 06/05/03

Peer Reviewer: Alan Roberts Date Completed: 06/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	pH	Conductivity
SPRING9-T01N-GRW	SA	521747		W	X	X				X	X
SPRING9-D01N-GRW	SA	521748		W	X						
SPRING9A-T01N-GRW	SA	521749		W	X	X				X	X
SPRING9A-D01N-GRW	SA	521750		W	X						
SPRING10-T01N-GRW	SA	521751		W	X	X				X	X
SPRING10-D01N-GRW	SA	521752		W	X						
SPRING12-T01N-GRW	SA	521753		W	X	X				X	X
SPRING12-D01N-GRW	SA	721754		W	X						
SPRING17-T01N-GRW	SA	721755		W	X	X				X	X
SPRING17-D01N-GRW	SA	721756		W	X						
SPRING15-T01N-GRW	SA	721757		W	X	X				X	X
SPRING15-D01N-GRW	SA	721758		W	X						
SPRING14T-T01N-GRW	SA	721759		W	X	X				X	X
SPRING14T-D01N-GRW	SA	721760		W	X						
SPRING18-T01N-GRW	SA	721761		W	X	X				X	X
SPRING18-D01N-GRW	SA	721762		W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory noted sample identifiers were abbreviated, in certain instances, to accommodate field length limitations in the data processing. Upon review of the sample ids, it was verified that all were complete and the comment by the laboratory was incorrect.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations. The laboratory noted that aluminum, calcium, iron, magnesium, manganese, sodium, and zinc were reported from the full strength analysis due to the low concentration of these analytes in the solid samples.

The laboratory case narrative noted the metals analysis of the continuing calibration verification standard CCV5 yielded a marginally elevated response for zinc. Upon review of the raw data sheets for ICP-AES, it was determined that the continuing calibration standard in question was actually CCV4 which recovered zinc at 110.8% (marginally above the established control limit of 90-110% recovery). This slightly high recovery would indicate a potential high bias in the zinc results. Due to the fact that all zinc concentrations for the samples associated with this calibration verification were nondetect, no qualification of the data was considered necessary on the basis of elevated continuing calibration verification recovery.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Several nitrate, nitrite, and orthophosphate samples were run several hours beyond the 48-hour holding time. The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken either 12 or 14 days after sampling and 10 days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD SPRING-17-T01N-GRWMS SPRING17-D01N-GRWMS • PDS • LD SPRING-17-T01N-GRWREP SPRING-17-D01N-GRWREP	Yes	The laboratory case narrative noted the replicate analyses associated with sample SPRING17-T01N-GRW exhibited RPDs above the control criteria for ammonia, orthophosphate, total phosphorus, and TOC. The duplicate sample report summary verified the relative percent differences for these four analytes were reported at 200% (all duplicate samples results were nondetect and the RPD calculation used 0.0 mg/L for the duplicate concentration). For all four analytes, the sample concentrations and the associated duplicate results were less than 5x the RL. Therefore, the absolute differences between the two results were compared to an evaluation criterion of ≤ 1x the greater RL. Consequently, none of the ammonia, orthophosphate, total phosphorus, or TOC results required qualification on the basis of laboratory duplicates. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) SPRING17-T01N-GRWL SPRING17-D01N-GRWL • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses on samples SPRING17-T01N-GRW and SPRING17-D01N-GRW were not applicable for all 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL, (adjusted for dilution). It was therefore not necessary to qualify any results on the basis of serial dilutions. The orthophosphate concentrations in sampleSPRING-14T-T01N-GRW, SPRING10-T01N-GRW and sample SPRING18-T01N-GRW were greater than their total phosphorus concentrations. Due to the fact that neither partial nor total concentrations for either sample exceeded 5x the RL (0.010), the absolute difference between the partial and total results were compared to an evaluation criterion of ±2x RL. Accordingly, the orthophosphate and phosphorus results for samples SPRING10-T01N-GRW and SPRING18-T01N-GRW were qualified as estimated (J/UJ TVP-I) with an indeterminate direction of bias. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No Field QC samples were analyzed with the data in this package. The Field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho P	Conductivity	pH
SPRING9-T01N-GRW	0.86 J	0.005 UJ	0.040 J	1450 J	7.3 J
SPRING9A-T01N-GRW	1.1 J	0.005 UJ	0.038 J	1360 J	7.5 J
SPRING10-T01N-GRW	0.49 J	0.005 UJ	0.10 J	565 J	7.6 J
SPRING12-T01N-GRW	---	0.005 UJ	0.010 J	465 J	7.8 J
SPRING17-T01N-GRW	---	---	0.010 J	457 J	7.4 J
SPRING15-T01N-GRW	---	---	0.011 J	214 J	7.9 J
SPRING14T-T01N-GRW	---	---	---	411 J	7.8 J
SPRING18-T01N-GRW	---	---	---	331 J	8.0 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	CCB7 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS)	0.8	0.8	0.8	0.8	0.8	0.9	0.8	0.614	0.30	SPRING15-T01N-GRW SPRING17-D01N-GRW SPRING17-T01N-GRW SPRING9-T01N-GRW	U MB,CCB-I
Arsenic (MS)	---	---	---	---	---	-0.2	---	---	0.20	SPRING14T-D01N-GRW SPRING14T-T01N-GRW SPRING15-D01N-GRW SPRING17-D01N-GRW SPRING17-T01N-GRW	J CCB-L UJ CCB-L
Selenium (MS)	---	---	-0.9	---	---	-1.0	---	-1.677	0.50	All samples	UJ MB,CCB-L UJ CCB-L J/UJ MB-L
Vanadium (MS)	-0.3	0.1	0.2	0.2	0.1	0.1	0.1	0.228	0.10	SPRING10-D01N-GRW SPRING10-T01N-GRW SPRING17-T01N-GRW SPRING9A-D01N-GRW SPRING9-D01N-GRW SPRING9-T01N-GRW	U MB,CCB-I U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT072C Sampling Event: April 2003

Matrix: Solid __ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 06/06/03

Peer Reviewer: Alan Roberts Date Completed: 06/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	pH	Conductivity
MW-7A-T01N-GRW	SA	521773		W	X	X	X	X
MW-7A-D01N-GRW	SA	521774		W	X			
MW-9A-T01N-GRW	SA	721775		W	X	X	X	X
MW-9A-D01N-GRW	SA	721776		W	X			
MW-10-T01N-GRW	SA	721777		W	X	X	X	X
MW-10-D01N-GRW	SA	721778		W	X			
MW-10-T01D-GRW	FD	721779		W	X	X	X	X
MW-10-D01D-GRW	FD	721780		W	X			
MW-1-T01N-GRW	SA	721781		W	X	X	X	X
MW-1-D01N-GRW	SA	721782		W	X			
MW-11-T01N-GRW	SA	721783		W	X	X	X	X
MW-11-D01N-GRW	SA	721784		W	X			
MW-4-T01N-GRW	SA	521785		W	X	X	X	X
MW-4-D01N-GRW	SA	521786		W	X			

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Several nitrate, nitrite, and orthophosphate samples were run several hours beyond the 48-hour holding time. The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 12 days after sampling and 10 days beyond log-in. The pH for all samples was measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MW-7A-T01N-GRWL • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample MW-7A-T01N-GRW was not applicable for 23 out of 24 metal analytes. Only calcium had a sufficiently high initial concentration, greater than a factor of 50 above the IDL, (adjusted for dilution). The percent difference in calcium results between the original sample and its 5-fold dilution (3.1%) was less than the evaluation criteria of 10%. It was therefore not considered necessary to qualify any results on the basis of serial dilutions. The orthophosphate concentration of 0.71 mg/L in sample MW-10-T01N-GRWwas greater than its corresponding phosphorus concentration of 0.028 mg/L. Due to the fact that both concentrations were not greater than five times the RL (0.02 mg/L), the absolute difference between the two results was compared to an evaluation criterion of ±2x RL (using the higher RL). Accordingly, the orthophosphate and phosphorus results for sample MW-10-T01N-GRW were qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No Field QC samples were analyzed with the data in this package. The Field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho P	Conductivity	pH
MW-7A-T01N-GRW	0.49 J	0.0050 UJ	0.034 J	1560 J	7.4 J
MW-9A-T01N-GRW	0.65 J	0.0050 UJ	0.014 J	1270 J	7.4 J
MW-10-T01N-GRW	0.62 J	0.0050 UJ	0.71 J	216 J	7.6 J
MW-10-T01D-GRW	0.61 J	0.0050 UJ	0.026 J	217 J	7.5 J
MW-1-T01N-GRW	---	---	---	1660J	7.4 J
MW-11-T01N-GRW	---	---	0.010 UJ	429 J	7.9 J
MW-4-T01N-GRW	---	---	0.016 J	237 J	7.8 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS)	0.9	0.7	0.7	---	---	0.730	0.3	MW-7A-T01N-GRW	U MB,CCB-I
Beryllium (P)	-2.5	-2.4	-2.3	-2.4	---	-2.601	0.3	All samples	UJ MB,CCB-L
Copper (P)	5.8	5.3	5.2	6.1	---	6.274	2.4	All samples	U MB,CCB-I
Iron (P)	---	---	---	72.1	---	---	42.2	None of the samples were associated with CCB4	---
Manganese (P)	---	---	1.7	2.1	---	---	1.3	MW-1-D01N-GRW	U CCB-I
Potassium (P)	1330.0	1391.0	1485.0	1371.0	---	1291.0	327.4	All samples	U MB,CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT073C

Sampling Event: Spring 2003 Surface Water

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 06/19/03

Peer Reviewer: Stacey Coker

Date Completed: 06/20/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses					
				Metals	Inorganics	BOD	COD	PH	Conductivity
RR-14-T01N-SFW	SA	521921	W	X	X	X	X	X	X
RR-14-D01N-SFW	SA	521922	W	X					
RR-13-T01N-SFW	SA	521923	W	X	X	X	X	X	X
RR-13-D01N-SFW	SA	521924	W	X					
RR-11C-T01N-SFW	SA	521925	W	X	X	X	X	X	X
RR-11C-D01N-SFW	SA	521926	W	X					
RR-12-T01N-SFW	SA	521927	W	X	X	X	X	X	X
RR-12-D01N-SFW	SA	521928	W	X					
RR-10-T01N-SFW	SA	521929	W	X	X	X	X	X	X
RR-10-D01N-SFW	SA	521930	W	X					
RR-7-T01N-SFW	SA	521931	W	X	X	X	X	X	X
RR-7-D01N-SFW	SA	521932	W	X					
RR-16-T01N-SFW	SA	521933	W	X	X	X	X	X	X
RR-16-D01N-SFW	SA	521934	W	X					
RR-16-T01D-SFW	FD	521935	W	X	X	X	X	X	X
RR-16-D01D-SFW	FD	521936	W	X					
RR-11A1-T01N-SFW	SA	521937	W	X	X	X	X	X	X
RR-11A1-D01N-SFW	SA	521938	W	X					
RR-10A1-T01N-SFW	SA	521939	W	X	X	X	X	X	X
RR-10A1-D01N-SFW	SA	521940	W	X					

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations. The laboratory noted that aluminum, calcium, iron, magnesium, manganese, sodium, and zinc were reported an undiluted (i.e. straight) analysis (rather than the 10x dilution as specified by the dilution scheme) due to poor agreement between replicate measurements . The results from the 10 fold dilution analysis were comparable to the results for the straight analysis.

The case narrative provided by the laboratory noted that during the ICP/MS analytical sequence designated 052403-02, the ICSAB exhibited a marginally elevated recovery for selenium. Data from a previous ICP/MS analysis, included in the raw data section of the data package, showed comparable selenium results for the field samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory log-in sheet noted the incorrect matrix suffixes were listed on the COC for samples with laboratory IDs sequenced 521929-521932. These samples were listed as groundwater samples (GRW), when in fact they were surface water samples (SFW). These errors were corrected at the time of log-in and consequently did not adversely affect data quality.
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for all samples were accomplished one day beyond the prescribed analytical holding time of 48 hours due to a malfunction of the IC instrument autosampler device. Accordingly, all nitrate results for all samples were qualified as estimated (J/UJ). The majority of nitrite, orthophosphate, and BOD_5 analyses for the samples in this data package were conducted several hours beyond the criterion of 48 hours for holding time. The results for the affected samples were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 12 days after sampling and 10 days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value for positive blank detections.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD RR-11C-T01N-SFWMS RR-11C-T01N-SFWMSD RR-11C-D01N-SFWMS RR-11C-D01N-SFWMSD • PDS • LD RR-11C-T01N-SFWREP RR-11C-D01N-SFWREP	No	As noted in the laboratory case narrative, the matrix spike recoveries of ammonia, orthophosphate, and COD for sample RR-11C-T01N-SFWMS were outside the control criterion of 75-125%. Both ammonia and orthophosphate yielded recoveries below the acceptance range indicating a potential low bias in sample results. The recovery for COD was above the acceptance range, thereby indicating the possibility of a high bias in the sample results. Table 1.3 summarizes these results along with the associated percent recoveries and the qualification codes assigned to the parent samples. The matrix quality control results for the 2003 Spring Surface Water sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. The laboratory case narrative noted the metals analysis of the replicate associated with sample RR-11C-T01N-SFW yielded a RPD (91%) for lead that was in excess of the control criteria. Upon review of the duplicate results for sample RR-11C-T01N-SFW, in conjunction with the specifications set forth in SOP 12.1, it was determined that qualification of the lead results for sample RR-11C-T01N-SFW as estimated (J/UJ) was necessary. Due to the fact that neither result was greater than 5x the CRDL (dilution factor of 1), the absolute difference between the sample and duplicate result for lead was compared to an evaluation criterion of 1x the CRDL. The absolute difference between the two values was 2.6 µg/L and the CRDL for lead is 2.0 µg/L. In addition, there were five other metal analytes (aluminum, calcium, iron, manganese, and zinc) which required further inspection, as their sample and duplicate results both exceeded 5x the CRDL (DF = 1). Their relative percent differences were compared to an evaluation criterion of ±20%. All RPDs for these five metal analytes were less than 20% and consequently did not require qualification of data. Likewise, for the duplicate analysis of sample RR-11C-D01N-SFW, calcium and manganese reported sample and duplicate concentrations in excess of 5x the CRDL (DF =1). The RPDs calculated for these two metal analytes were less than 20% and therefore did not require qualification on the basis of duplicate analysis.
Method QC • Surrogates • Serial Dilution (C) RR-11-T01N-GRWL • Total vs. Partial Analyses • Cation/Anion Balance	No	The laboratory case narrative noted the serial dilution analysis run on sample RR-11C-D01N-SFW was not reported, without explanation as to why. The serial dilution analysis run on sample RR-11C-T01N-SFW was not applicable for 21 out of 24 metal analytes. Initial concentrations for calcium, manganese, and zinc were greater than a factor of 50 above the IDL, (adjusted for dilution). The percent difference in the results between the original sample and its 5-fold dilution for all three analytes was less than the evaluation criteria of 10%. It was therefore not necessary to qualify any results on the basis of serial dilutions. The orthophosphate concentrations in three samples reported concentrations in excess of the associated total phosphorus concentrations and were accordingly qualified as estimated (J/UJ) with an indeterminate bias direction. Table 1.4 summarizes the orthophosphate and total phosphorus results qualified on the basis of total versus partial review. In one sample, neither total nor partial concentrations were > 5x the RL, therefore, the absolute difference between the two values was compared to an evaluation criterion of 2x RL (highest). For the remaining two samples, for which data qualification was necessary, both total and partial concentrations exceeded 5x the RL and the percent difference between the two results per sample was compared to an evaluation criterion of ±30%. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate RR-16-T01N/D-SFW RR-16-D01N/D-SFW • Rinsate Blank • Field Blank • Trip Blank	N/A	No Field QC samples were analyzed with the data in this package. The Field QC results for the 2003 Spring Surface Water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	The laboratory case narrative stated that the ICS recovery of Se was marginally high at 124% (with an acceptance range of 80-120%). As none of the interferent elements were present in the sample at concentrations comparable to those in the ICS solution, data qualification was not considered necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho P	BOD_5	Conductivity	pH
RR-14-T01N-SFW	0.65 J	0.0050 UJ	0.15 J	1.4 UJ	415 J	7.7 J
RR-13-T01N-SFW	0.64 J	0.0050 UJ	0.026 J	1.4 UJ	366 J	7.7 J
RR-11C-T01N-SFW	0.046 J	0.0050 UJ	0.038 J	1.4 UJ	356 J	7.6 J
RR-12-T01N-SFW	0.64 J	0.0050 UJ	0.010 UJ	1.4 UJ	354 J	7.7 J
RR-10-T01N-SFW	1.0 J	---	---	---	303 J	7.9 J
RR-7-T01N-SFW	1.1 J	---	---	---	304 J	7.9 J
RR-16-T01N-SFW	0.70 J	0.0050 UJ	0.12 J	1.4 UJ	374 J	7.7 J
RR-16-T01D-SFW	0.72 J	0.0050 UJ	0.010 UJ	1.4 UJ	377 J	7.7 J
RR-11A1-T01N-SFW	0.52 J	0.0050 UJ	0.010 UJ	1.4 UJ	290 J	7.9 J
RR-10A1-T01N-SFW	0.47 J	---	---	---	275 J	8.0 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P)	71.0	79.5	93.0	105.4	102.7	---	50.3	RR-10A1-D01N-SFW RR-10-D01N-SFW RR-11A1-D01N-SFW RR-11C-D01N-SFW RR-12-D01N-SFW RR-13-D01N-SFW RR-14-D01N-SFW RR-16-D01D-SFW RR-16-D01N-SFW RR-7-D01N-SFW	U CCB-I
Antimony (MS)	0.9	0.8	0.7	0.7	---	0.383	0.30	RR-11C-D01N-SFW RR-12-T01N-SFW RR-14-T01N-SFW RR-7-T01N-SFW	U MB,CCB-I
Beryllium (P)	0.4	1.1	0.9	0.5	1.0	---	0.30	All samples with the **exception** of: RR-14-D01N-SFW	U CCB-I
Iron (P)	---	48.7	---	37.4	50.6	---	31.1	RR-11A-D01N-SFW RR-14-D01N-SFW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Comment	Action
RR-11C-T01N-SFW					
Ammonia-Nitrogen	74.2%	NA	75-125%	MS% R < 75%	0.046 J MS-L
Orthophosphate-P	64.9%	NA			0.038 J MS-L
Chemical Oxygen Demand	136.0%	NA		MS% R > 75%	No Qualification (parent sample nondetect)

NA = Not appropriate

Table 1.4
Total vs. Partial Data Qualifications

Sample	Ortho-Phosphate (mgL)	Total Phosphate (mg/L)	Criteria	Qualification Code
RR-10-T01N-SFW	0.14	0.047	|Diff|>2xRL	J TvP-I
RR-14-T01N-SFW	0.15	0.072	% D > 30%	Or
RR-16-T01N-SFW	0.12	0.072		UJ TvP-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT074C Sampling Event: 2003 April Ground Water

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **Yes**

LP Reviewer: Brian Olmsted Date Completed: 1/29/04

Data Reviewer: Karen Kronoveter Date Completed: 06/25/03

Peer Reviewer: Alan Roberts Date Completed: 07/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOC	SVOC	PH	Conductivity	Explosives
COMPCABINS-T01N-GRW	SA	521947	COMPCABINSTO	W	X	X			X	X	X
COMPCABINS-D01N-GRW	SA	521948		W	X						
TB177-GRW	TB	521949		W			X				
LABWELL-T01N-GRW	SA	521950	LABWELLT01NGRW	W	X	X	X	X	X	X	
LABWELL-D01N-GRW	SA	521951		W	X						
FAGERQUIST-T01N-GRW	SA	521952	FAGERQUISTTO	W	X	X			X	X	X
FAGERQUIST-D01N-GRW	SA	521935		W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate BlankFB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations. The laboratory noted that aluminum, calcium, iron, magnesium, manganese, sodium, and zinc were reported from an undiluted (i.e. straight) analysis (rather than the 10x dilution as specified by the dilution scheme) due to poor %RSD between

replicates. The results from the 10 times dilution analysis were comparable to the results for the straight analysis. No qualification was necessary.

During the ICP/MS analytical sequence designated 052603-03, the continuing calibration check standards and blanks designated CCV4, CCB3, and CCB4 exhibited slightly elevated internal standard recoveries for Tb and Bi. CCV4 exhibited acceptable percent recoveries for all target elements, and the CCBs were free of contamination. The samples in this delivery package were run between CCB1 and CCV3. All CCBs and CCVs, which were associated with the samples in this package, exhibited acceptable percentages. No data qualification was necessary.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW074C, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified by the laboratory on the quantitation reports. Included in the data package were the extracted ion current profiles.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for all samples were accomplished one day beyond the prescribed analytical holding time of 48 hours due to a malfunction of the IC instrument autosampler device. Accordingly, all nitrate results for all samples were qualified as estimated (J). One orthophosphate analysis in this data package was conducted several hours beyond the criterion of 48 hours for holding time. The results for the affected sample was qualified as estimated (UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 12 days after sampling and 10 days beyond log-in. The pH for all samples was measured approximately four hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Antimony was detected in the metal preparation blank and continuing calibration blanks at the following negative concentrations (µg/L): CCB1 (-0.4), CCB2 (-0.6), CCB3 (-0.7), and MB (-1.975). All antimony results were reported as nondetect at the IDL of 0.60. As a consequence, all antimony results were evaluated for a potential low bias and were qualified as estimated (UJ) with a qualifier code of MB, CCB-L. In addition, molybdenum was detected at a concentration of 2.936 µg/L in the method blank. All samples in this delivery group reported molybdenum concentrations less than five times the blank value, indicating the possibility of reporting false positives. Consequently all molybenum results were qualified as nondetect at the concentration reported and assigned a bias code of indeterminate. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKE4. TICs in method blanks are not considered to be reportable as TICs for samples and such identification as TICs were rejected. The multiple unknown compounds not detected in the method blank were

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value. No qualification of organic target analytes (volatile or semivolatile) was necessary on the basis of method blank detections.
Matrix QC • MS/MSD • PDS • LD	Yes	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the 2003 April Ground Water sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) COMPCABINS-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery of surrogate compound Phenol-d5 in the semivolatile analysis of sample E4LCS was 112%, outside the acceptance range limit of 10-110%. No qualification of associated data was necessary due to the fact that the 3 remaining acid fraction surrogate recoveries were within acceptable ranges. The surrogate recovery of surrogate compound Terphenyl-d14 in the semivolatile analysis of sample E4LCS was 150%, outside the acceptance range limit of 33-141%. No qualification of associated data was necessary due to the fact that the 3 remaining base/neutral fraction surrogate recoveries were within acceptable ranges. The serial dilution analysis on sample COMPCABINS-T01N-GRW was not applicable for 23 of the 24 metal analytes, as the initial sample results for only one analyte (calcium) was sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent difference between the initial sample result and the serial dilution result (5x), was compared to an evaluation criteria of ±10% for calcium. The reported % difference for molybdenum was 0.4%, meeting the criterion. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank TB177-GRW	N/A	All results for TB177-GRW were nondetect. The Field QC results for the 2003 April Ground water 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	No	Tables 1.2a and 1.2b summarized the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues.
Initial/Continuing Calibration Verification	No	Four SVOC ICV method spike recoveries were below QC limits. Table 1.3 summaries the results.
Laboratory Control Sample Results	No	5 of 9 analytes analyzed for the SVOC LCS and LCSD displayed percent recoveries exceeding QC limits. No qualification was performed because analyte sample results were non-detect.
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho P	Conductivity	pH
COMPCABINS-T01N-GRW	0.42 J	---	---	184 J	7.3 J
LABWELL-T01N-GRW	0.40 J	---	0.010 UJ	294 J	7.2 J
FAGERQUIST-T01N-GRW	0.40 J	---	---	162 J	7.2 J

Table 1.2a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% RSD >30%	Action	Qualification and Qualification Codes
VOC	04/07/03 (1234)	2-Hexanone	50.0	Results for this analyte in both VOC samples were qualified as estimated.	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.2b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
SVOC	04/15/03 (0751)	2,4-Dinitrophenol	26.7	Sample results in LABWELL-T01N-GRW (only SVOC sample) was qualified as estimated	UJ CCAL-I
		3,3'Dichlorobenzidine	34.4		

CCAL = Continuing Calibration %D = Percent

Table 1.3
Initial Calibration Verification Results For Method Spike Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	Analyte	% Recovery	QC Limits	Qualification Codes
SVOC	2,4-Dimethylphenol	64.42	75-125	UJ ICV-L
	3-Nitroaniline	66.06		
	2,4-Dinitrophenol	66.72		
	4-Nitrophenol	71.38		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT075C Sampling Event: 2003 April Groundwater

Matrix:: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 06/25/03

Peer Reviewer: Alan Roberts Date Completed: 07/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOC	SVOC	PH	Conductivity	Explosives
TB175-GRW	TB	521941		W			X				
MMW-43A-T01N-GRW	SA	521942	MMW-43A-GRW	W	X	X	X	X	X	X	
MMW-43A-D01N-GRW	SA	521943		W	X						
TB178-GRW	TB	521944		W			X				
MMW-44B-T01N-GRW	SA	521945	MMW-44B-GRW MMW44BT01NGR	W	X	X	X	X	X	X	X
MMW-44B-D01N-GRW	SA	521946		W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW075C, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified by the laboratory on the quantitation reports. Included in the data package were the extracted ion current profiles.

The laboratory case narrative noted the nitroaromatic confirmation analysis on the CN column of sample MMW-44B-T01N-GRW was performed three days beyond the prescribed analytical holding time of 40 days after extraction. The primary column analysis was performed on the LC18 column within holding time. The second column functions to verify the presence of an analyte. The surrogate 1,2-Dinitrobenze was recovered on the first column C-18 and 97% and on the second column CN at 104%. No qualification of data was considered necessary as all target analytes were nondetect on the first column and were not dependent on the second column for verification of their presence.

Review Parameter	CriteriaMet?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 11 days after sampling and 10 days beyond log-in. The pH for all samples was measured approximately four hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J).
Method Blanks	No	Antimony was detected in the metal preparation blank and continuing calibration blanks at the following negative concentrations (µg/L): CCB1 (-0.4), CCB2 (-0.6), CCB3 (-0.7), and MB (-1.975). All antimony results were reported as nondetect at the IDL of 0.60. As a consequence, all antimony results were evaluated for a potential low bias and were qualified as estimated (UJ) with a qualifier code of MB, CCB-L. Vanadium was detected in CCB1 at a concentration –0.2 µg/L. As none of the samples were associated with this calibration event, no qualification of vanadium results was necessary. Aluminum was detected in the method blank at a concentration of 45.620 µg/L. All samples with the exception of MMW-43A-T01N-GRW reported concentrations of aluminum less than 5x the concentration detected in the preparation blank and were accordingly qualified as nondetect at the reported concentrations. 1,2,4-Trichlorobenzene was detected in BLKK02 (04/08/03), one of the two volatile blanks presented with this data package. All volatile samples analyzed were run on 04/07/03, and were therefore associated with VBLKN8, which reported all target analytes as nondetect. The LCS (LAP0AQ) and holding blank (HBW075C), associated with BLKK02, reported 1,2,4-Trichlorobenzene as nondetect. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKE4. TICs in method blanks are not considered to be

Review Parameter	CriteriaMet?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		reportable as TICs for samples and such identification as TICs was rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value. No qualification of organic target analytes (volatile or semivolatile) was necessary on the basis of method blank detections.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the 2003 April Ground Water sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MMW-43A-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery of surrogate compound Phenol-d5 in the semivolatile analysis of sample E4LCS was 112%, outside the acceptance range limit of 10-110%. No qualification of associated data necessary due to the fact that the 3 remaining acid fraction surrogate recoveries were within acceptable ranges. The surrogate recovery of surrogate compound Terphenyl-d14 in the semivolatile analysis of sample E4LCS was 150%, outside the acceptance range limit of 33-141%. No qualification of associated data was necessary due to the fact that the 3 remaining base/neutral fraction surrogate recoveries were within acceptable ranges. The serial dilution analysis on sample MMW-43A-T01N-GRW was not applicable for 17 of the 24 metal analytes. The initial sample results for seven analytes (aluminum, calcium, iron, magnesium, manganese, sodium, and zinc) were sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent difference between the initial sample result and the serial dilution result (5x), was compared to an evaluation criteria of ±10% for these seven analytes. All reported % differences were less than 10%, thereby removing the necessity to qualify any data on the basis of serial dilution. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank TB175-GRW TB178-GRW	N/A	All results for TB175-GRW and TB178-GRW were nondetect. The Field QC results for the 2003 April Ground water 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	CriteriaMet?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Detected organic analytes with concentrations between the MDL and RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: VOCs/SVOCs: Initial Calibration VOCs/SVOCs: Continuing Calibration SVOC: Initial Calibration Verification Tables 1.1 summarizes the continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. Samples MMW-44B-T/D01N contained concentrations of one or more interferent elements (Al, Ca, Mg, and Fe) comparable to those in the interference check samples (ICSs). As such, it was necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains the interferent elements). Several ICP sample results were qualified on the basis of biases suggested by the ICS A analyses. Table 1.2 summarizes the analytes and samples for which qualification was necessary. Upon review of the summary forms, it was noted that there were several semivolatile organic compounds recovered above the QC limits, indicating a potential high bias in the reporting of these analyte results. Table 1.5 summarizes the percent recoveries and the QC limits established by the laboratory. No target analytes were detected in any of the associated field samples and therefore no qualification were necessary. Table 1.3 summarizes qualifications on the basis of initial calibration verification for semivolatile analytes in all SVOC samples.

Table 1.1
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
VOC	04/08/03 (0654)	2-Hexanone	57.7	None of the samples were associated with this calibration event	No Qualification
		Acetone	29.5	Common laboratory contaminant	No Qualification
SVOC	04/15/03 (0751)	2,4-Dinitrophenol	26.7	MMW-43A-T01N-GRW	UJ CCAL-I
		3,3'-Dichlorobenzidine	34.4		
SVOC	04/16/03 (0628)	2,4-Dinitrophenol	39.1	MMW-44B-T01N-GRW	
		3,3'-Dichlorobenzidine	28.7		

CCAL = Continuing Calibration %D = Percent difference

Table 1.2
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Boron	51	7.5	MMW-44B-D01N-GRW MMW-44B-T01N-GRW	J ICS-H
Molybdenum	-3	1.6		
Zinc	27	2.5		
Vanadium	-1	0.10		J ICS-L or UJ ICS-L
Manganese	-1	0.9	Neither sample required qualification of manganese or nickel data due to the fact that the analyte concentrations in the samples were sufficiently high enough that a low or high bias suggested by ICS A analyses accounts for less than 25% of the reported analyte concentration.	
Nickel	-3	2.6		

The interferent element calcium was present in samples MMW-44B-D/T01N-GRW at concentrations comparable to that in the interference check samples (ICSs). As such, these two samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present).

Table 1.3
Initial Calibration Verification Results For Method Spike
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	Analyte	% Recovery	QC Limits	Qualification Codes
SVOC	2,4-Dimethylphenol	64.42	75-125	UJ ICV-L
	3-Nitroaniline	66.06		
	2,4-Dinitrophenol	66.72		
	4-Nitrophenol	71.38		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT076A Sampling Event: April 2003

Matrix: Solid __ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 07/09/03

Peer Reviewer: Stacey Coker Date Completed: 07/22/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	pH	Conductivity
GOATHILLSEEP-T01N-GRW	SA	521955	GOATHILLSEEP-T01N-G	W	X	X				X	X
GOATHILLSEEP-D01N-GRW	SA	521956	GOATHILLSEEP-D01N-G	W	X						
SPRING14M-T01N-GRW	SA	521957		W	X	X				X	X
SPRING14M-D01N-GRW	SA	521958		W	X						
SPRING39-T01N-GRW	SA	521959		W	X	X				X	X
SPRING39-D01N-GRW	SA	521960		W	X						
LOWERSPRING13-T01N-GRW	SA	522022	LOWERSPG13-T01N-GRW	W	X	X				X	X
LOWERSPRING13-D01N-GRW	SA	522023	LOWERSPG13-D01N-GRW	W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

The laboratory noted the continuing calibration check standards and blanks designated CCV4, CCB3, and CCB4 exhibited slightly elevated internal standard recoveries for Tb and Bi (120.7% and 124.9%,

respectively) during the ICP/MS analytical sequence 052603-03 for CCV4. None of the samples were associated with CCV4 or CCB4. CCB3 recovered the internal standard ^{209}Bi at 121.2%. the lead and thallium results for the samples associated with this continuing calibration blank were diluted and reanalyzed. Accordingly, no qualification of data was necessary, as this did not affect the quality or usability of the data.

Via a letter from Stacey Coker (URS) to Don Dawicki (STL) dated 04/09/03, the analyses for samples SPRING13-T/D01N-SFW (sampled on 04/04/03) were canceled due to a malfunction in the seepage interceptor collection system. Samples collected from this location were not considered representative of the system because the pump was not functioning properly due to ice in the system. These priority locations were re-collected later when the pump was functioning properly. The replacement samples were collected on 04/09/03 and were reported in data delivery group WAT088A. The original laboratory IDs (522020/1) that were assigned on 04/07/03 when the delivery group was logged in at the laboratory remained with the samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	No problems were noted
Holding Times	No	As noted in the laboratory case narrative, sample LOWERSPG13-T01N-GRW was received one day beyond the prescribed analytical holding time of 48 hours for nitrate, nitrite, and orthophosphate. According to the laboratory, the analyses for the above mentioned analytes were run as soon as possible upon receipt. The nitrate analysis for this sample was run five days beyond log in and eight days beyond sampling. It was verified from the internal chain of custody sheets that the sample had been prepared approximately five hours beyond log-in, which would be approximately 80 hours after sampling. Both nitrite and orthophosphate were analyzed approximately six hours after log-in and three and a half days beyond sampling. Accordingly, nitrate, nitrite, and orthophosphate were qualified as estimated (J/UJ) with an indeterminate direction of bias. In addition, nitrate as N for sample SPRING14M-T01N-GRW, was analyzed several hours beyond the 48-hour holding time and was therefore qualified as estimated (UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 11 days after sampling and either eight or ten days beyond log-in. The pH for all samples was measured approximately four to five hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J).
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (A) GOATHILLSEEP-T01N-GRW LOWERSPG13-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The internal standard recovery of ^{89}Y was high for the ICPMS analyses of samples LOWERSPRING13-T01N-GRW and LOWERSPRING13-D01N-GRW. Accordingly, molybdenum results for these samples, as verified by the run-logs, were reported form the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Two serial dilution analyses were run and presented with the data in this package; one for ICP-MS metals (GOATHILLSEEP-T01N-GRW) and the other for ICP metals (LOWERSPG13-T01N-GRW). The serial dilution analysis on sample GOATHILLSEEP-T01N-GRW was not applicable for all six ICP-MS metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL, (adjusted for dilution). The serial dilution for the ICP metals, run on sample LOWERSPG13-T01N-GRW, was applicable to only one of the 18 metal analytes. The initial manganese sample result was sufficiently larger (50x) than the IDL, adjusted for a dilution factor of 100. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. The percent difference for manganese was 7.0%, thereby meeting the criterion specified in the SOP (12.1). It was not necessary to qualify any metal data on the basis of serial dilution results. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. The laboratory case narrative noted all samples in this delivery group exhibited ion balance percent differences within the acceptance range with the exception of sample SPRING14M-T/D01N-GRW, which exhibited an elevated percent difference of 28.92%. The cation/anion balances for this sample was verified independently. The laboratory suspected the elevated percent difference was due to several of the cations reported as nondect at elevated RL (due to dilution protocol of class "A" samples). The independent cation/anion balance calculation verified two of the three cations which contributed a sum of 73.88% to the cation balance were nondetect and reported at elevated reporting limits. The concentrations for both cations (magnesium and sodium) were low enough that the reporting limits controlled the calculations. The balance was therefore not an appropriate measure of accuracy. No qualification of data in this delivery group was considered necessary on the basis of cation/anion imbalances. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No field QC samples were analyzed with this package. The field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. Samples GOATHILLSPRING-T/D-GRW, SPRING14M-D/T01N-GRW, SPRING13-D/T01N-GRW, and LOWERSPRING13-D/T01N-GRW were classified as pH category (A), indicating a pH < 5.6. These samples were

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		accordingly run at a dilution factor of 10 for ICP-MS, as described in the dilution scheme. Samples SPRING39-D/T01N-GRW were classified as pH category (B), and were therefor run at a 2x dilution.
Package Completeness	No	There was not an instrument detection limit sheet (form 10) for the ICP-MS included with this data package. The laboratory has been notified about the lack of this information and we are waiting for its arrival to include with the data package.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the laboratory performance reviews, the following additional parameters were evaluated: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH
GOATHILLSEEP-T01N-GRW	---	---	---	1700 J	5.4 J
SPRING14M-T01N-GRW	0.40 UJ	---	---	523 J	5.3 J
SPRING39-T01N-GRW	---	---	---	210 J	6.7 J
LOWERSPRING13-T01N-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	2110 J	4.2 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS)	-0.4	-0.6	-0.7	-0.7	-1.975	0.30	All samples were qualified	UJ MB,CCB-L
Aluminum (P)	---	---	---	---	188.0	27.7	GOATHILLSEEP-T/D01N-GRW SPRING14M-T/D01N-GRW	U MB-I
Chromium (P)	-0.9	---	-1.0	---		0.90	All samples were qualified	UJ CCB-L or J CCB-L
Copper (P)	---	---	-3.2	-2.6	4.560	2.40	All samples were qualified	U MB-I or UJ MB, CCB-L or UJ CCB-L
Iron (P)	---	51.9	---	---	30.24	29.9	SPRING39-T01N-GRW	U MB,CCB-I
Manganese (P)	---	0.9	---	---	---	0.900	SPRING39-T01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT077C Sampling Event: April 2003

Matrix: Solid __ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 07/23/03

Peer Reviewer: Stacey Coker Date Completed: 07/23/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses		
					Metals	pH	Conductivity
OUTFALL002WELL-T01N-GRW	SA	521961	OUTFALL002WELL-T01N-GRW OUTF002WELL-T01N-GRW OUTFA002SUMP-T01N-GRW	X	X	X	X
OUTFALL002WELL-D01N-GRW	SA	521962	OUTFALL002WELL-D01N-GRW OUTF002-D01N-GRW OUTFA002SUMP-D01N-GRW	X			

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

The chain of custody lists the samples in this data package as "OUTFALL002WELL-T01N-GRW" and "OUTFALL002-WELL-D01N-GRW". The laboratory lists the same samples as "OUTFALL002-SUMP-

T01N-GRW" and "OUTFALL002-SUMP-D01N-GRW", with the IDs truncated in several forms, as described in the table above. The various forms of the sample IDs represent the same samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	No problems were noted.
Holding Times	No	Nitrate as N for sample OUTFALL002SUMP-T01N-GRW was analyzed one day beyond the 48-hour holding time and was therefore qualified as estimated (J) with an indeterminate direction of bias. The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. The conductivity measurement for sample OUTFALL002SUMP-T01N-GRW was taken 12 days after sampling and ten days beyond log-in. The pH for the same sample was measured approximately six hours beyond log-in. Therefore, the conductivity and pH results for this sample were qualified as estimated (J), with an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) OUTFALL002SUMP-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample OUTFALL002SUMP-T01N-GRW was not applicable for 21 of the 24 metal analytes, as the initial sample results for only three analytes were sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent differences (%Ds) between the initial sample results and the serial dilution results (5x) were compared to an evaluation criteria of ±10% for the three analytes. All reported %Ds were less than 10%. It was therefore not necessary to qualify any results on the basis of serial dilution. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. The laboratory case narrative noted all samples in this delivery group exhibited ion balance percent differences within the acceptance range. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No field QC samples were analyzed with this package. The field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS)	-0.4	-0.6	---	---	-1.975	0.3	OUTFALL002SUMP-T01N-GRW OUTFALL002SUMP-D01N-GRW	UJ MB,CCB-L
Chromium (P)	-0.9	---	-1.0	---	---	0.9		UJ CCB-L
Copper (P)	---	---	-3.2	-2.6	4.560	2.4		
Vanadium (P)	-0.2	---	---	---	---	0.10	OUTFALL002SUMP-D01N-GRW	J MB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

For the sake of brevity, the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT078C Sampling Event: April 2003

Matrix: Solid __Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 06/12/03

Peer Reviewer: Stacey Coker Date Completed: 06/18/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	pH	Conductivity
MW-24-T01N-GRW	SA	521882		W	X						
MW-24-D01N-GRW	SA	521883		W	X	X				X	X
RB06T-GRW	RB	521884		W	X						
MW-15-T01N-GRW	SA	521885		W	X	X				X	X
MW-15-D01N-GRW	SA	521886		W	X						
RB07T-GRW	RB	521887		W	X	X				X	X
RB07D-GRW	RB	521888		W	X						
MW-20-T01N-GRW	SA	521889		W	X	X				X	X
MW-20-D01N-GRW	SA	521890		W	X						
MW-20-T01D-GRW	FD	521891		W	X	X				X	X
MW-20-D01D-GRW	FD	521892		W	X						
MW-12-T01N-GRW	SA	521893		W	X	X				X	X
MW-12-D01N-GRW	SA	521894		W	X						
RB08T-GRW	RB	521895		W	X	X				X	X
RB08D-GRW	RB	521896		W	X						
TB180-GRW	TB	521897		W			X				
FB02T-GRW	FB	521898		W			X	X			
MW-17-T01N-GRW	SA	521899	MW-17-GRW	W	X	X	X	X		X	X
MW-17-D01N-GRW	SA	521900		W	X						
MW-2-T01N-GRW	SA	521901		W	X	X				X	X
MW-2-D01N-GRW	SA	521902		W	X						
MW-14-T01N-GRW	SA	521903		W	X	X				X	X
MW-14-D01N-GRW	SA	521904		W	X						
MW-13-T01N-GRW	SA	521905		W	X	X				X	X
MW-13-D01N-GRW	SA	521906		W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

The laboratory noted all of the continuing calibration check standards for silver (ICP-MS) exhibited percent recoveries marginally below the control criteria of 90-110%. The samples were re-analyzed, resulting in similar results. The highest continuing calibration verification (CCV) standard percent recoveries for the silver results reported were (CCV1: 87.2%, CCV2: 85.9%, CCV3: 85.1%, and CCV4: 85.3%). Accordingly, all silver results were qualified as estimated (UJ) with a low bias direction and qualifier code of "CCV".

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW078C, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified on the quantitation reports. Included in the data package were the extracted ion current profiles.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory log-in sheet noted the inorganic suite was not marked off on the COC for sample RB06T-GRW, although the necessary volume for the analysis was received. Based on communication with the sample manager, the laboratory project manager instructed sample receiving personnel to log the sample in for the inorganic analyses. The sampling times for several samples were inadvertently omitted from the COC, but were obtained from the sample labels.
Holding Times	No	All nitrate analyses and most of the nitrite and orthophosphate samples were run several hours beyond the 48-hour holding time. The laboratory case narrative noted the fluoride analyses for samples MW-15-T01N-GRW, RB07T-GRW, and RB08T-GRW were run 26 days beyond the prescribed analytical holding time of 28 days, due to an oversight in the laboratory. Upon review of the sample summary forms, it was concluded that the fluoride analysis for three of the rinsate blanks (RB06T-GRW, RB07T-GRW and RB08T-GRW) analyzed with this data package were run on 05/26/03 (which would correspond with 26 days beyond the holding time).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		Fluoride for sample MW-15-T01N-GRW was analyzed on 04/15/03, within the established holding time criteria. The cation/anion imbalances originally calculated by the laboratory for samples MW-2-T01N-GRW and MW-13-T01N-GRW resulted in the necessity to reanalyze sulfate 32 days beyond the analytical holding time of 28 days, resulting in the qualification of these two concentrations as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken either 6 or 12 days after sampling and 4 or10 days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKE4. TICs in method blanks are not considered to be reportable as TICs for samples and such results were flagged as unusable (R). The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value. No qualification of organic data (volatile or semivolatile) was necessary on the basis of method blank detections of target analytes.
Matrix QC • MS/MSD • PDS • LD	Yes	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MW-24-T01N-GRWL • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery of surrogate compound Phenol-d5 in the semivolatile analysis of sample E4LCS was 112%, outside the acceptance range limit of 10-110%. No qualification of associated data set necessary due to the fact that the 3 remaining acid fraction surrogate recoveries were within acceptable ranges. The surrogate recovery of surrogate compound Terphenyl-d14 in the semivolatile analysis of sample E4LCS was 150%, outside the acceptance range limit of 33-141%. No qualification of associated data set was necessary due to the fact that the 3 remaining base fraction surrogate recoveries were within acceptable ranges. The serial dilution analysis on sample MW-24-T01N-GRW was not applicable for all 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL, (adjusted for dilution). It was therefore not necessary to qualify any results on the basis of serial dilutions. The orthophosphate concentrations in seven samples reported concentrations in excess of the associated total phosphorus concentrations and were accordingly qualified as estimated (J/UJ) with an indeterminate bias direction. Table 1.3 summarizes the orthophosphate and total phosphorus results qualified on the basis of total versus partial review. In all seven samples, the reported concentrations were not both > 5x the RL, therefore, the absolute difference between the two values was compared to an evaluation criterion of 2x RL (highest).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The zinc concentration of 544 µg/L in the filtrate (dissolved) sample MW-15-D01N-SFW was greater than the iron concentration of 14.0 µg/L in the corresponding total metals sample, MW-15-T01N-SFW. Due to the fact that both values were not greater than 5x the RL, the absolute difference between the two results was compared to an evaluation criterion of 2x the RL (adjusted for a dilution factor of 10 = 14 µg/L). Accordingly, the zinc results for both samples were qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. The laboratory case narrative noted all samples in this delivery group exhibited ion balance percent differences within the acceptance range with the exception of rinsate blank samples (RB07*-GRW and RB08*-GRW), and samples MW-2-*01N-GRW and MW-13-*01N-GRW. The laboratory reported a cation/anion balance calculation of 8.74% for sample MW-2-*01N-GRW and 3.64% for MW-13-*01N-GRW, both within the acceptance range of +/-13%. The cation/anion balances for these two samples were verified independently. The laboratory case narrative stated the initial cation/anion balances for samples MW-2-*01N-GRW and MW-13-*01N-GRW were out due to sulfate. Sulfate was consequently reanalyzed for these samples, resulting in acceptable cation/anion balances, with the sulfate results qualified on the basis of holding time. The cation/anion balances reported for samples RB07*-GRW and RB08*-GRW were 45.87% and 27.88%, respectively. The cation/anion balances for these samples were verified independently. The concentrations in both samples were low enough that the reporting limits controlled the calculations. The balance was therefore not an appropriate measure of accuracy. No qualification of data in this delivery group was considered necessary on the basis of cation/anion imbalances. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5, with the exception of RB07*-GRW and RB08*-GRW; which reported TDS ratios of 4.63 and 1.60, respectively. Due to the fact that the TDS calculated was greater than the TDS measured, the TDS results for these samples were qualified as estimated (J) with a low bias direction and qualifier code of "TvP".
Field QC • Field Duplicate MW-20-T01N/D-GRWREP MW-20-D01N/D-GRWREP • Rinsate Blank RB06T-GRW RB07D-GRW RB07T-GRW RB08D-GRW RB08T-GRW • Field Blank FB02T-GRW • Trip Blank TB180-GRW	N/A	Multiple analytes were detected in the rinsate blanks and field blank analyzed with this data set. Table 1.4 summarizes the analytes detected and their reported concentrations. For samples MW-20-T01D-GRW and MW-20-T01N-GRW the phosphorus field duplicate results were outside evaluation criteria. Phosphorus results for these samples were qualified as estimated (J FD-I). The Field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: VOCs/SVOCs: Initial Calibration VOCs/SVOCs: Continuing Calibration SVOC: Initial Calibration Verification Tables 1.5a and 1.5b summarized the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. Table 1.6 summarizes qualifications on the basis of initial calibration verification for semivolatile analytes in all SVOC samples.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho P	Fluoride	Sulfate	Conductivity	pH
MW-24-T01N-GRW	1.8 J	0.0050 UJ	0.16 J	---	---	366 J	7.7 J
RB06T-GRW	0.40 UJ	0.0050 UJ	0.060 J	0.10 UJ	---	---	6.8 J
MW-15-T01N-GRW	0.41 J	0.0050 UJ	0.019 J	---	---	1890 J	7.2 J
RB07T-GRW	0.40 UJ	0.0050 UJ	0.23 J	0.10 UJ	---	---	7.1 J
MW-20-T01N-GRW	2.0 J	0.0050 UJ	0.027 J	---	---	432 J	7.2 J
MW-20-T01D-GRW	2.0 J	0.0050 UJ	0.025 J	---	---	429 J	7.3 J
MW-12-T01N-GRW	0.57 J	0.0050 UJ	0.11 J	---	---	284 J	7.7 J
RB08T-GRW	0.56 J	0.0050 UJ	0.21 J	0.10 UJ	---	---	7.3 J
MW-17-T01N-GRW	0.89 J	0.0050 UJ	0.40 J	---	---	680 J	7.5 J
MW-2-T01N-GRW	1.1 J	---	---	---	305 J	737 J	7.6 J
MW-14-T01N-GRW	0.40 UJ	---	---	---	---	935 J	7.5 J
MW-13-T01N-GRW	0.71 J	0.0050 UJ	0.38 J	---	221 J	673 J	8.2 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS)	0.7	0.5	0.5	0.5	---	---	---	0.30	MW-14-D01N-GRW MW-24-T01N-GRW	U CCB-I
Beryllium (P)	---	-0.3	-1.0	-0.7	-0.7	---	-0.755	0.3	All of the samples	UJ MB,CCB-L
Copper (P)	---	3.1	4.0	4.5	4.5	---	2.203/ 4.129	1.5	All of the samples	U MB,CCB-I
Vanadium (P)	-0.1	---	---	---	---	---	---	0.10	MW-15-D01N-GRW MW-15-T01N-GRW MW-24-D01N-GRW RB06T-GRW	J CCB-L
Zinc (P)	---	---	---	---	---	---	2.935	1.4	MW-24-T01N-GRW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Data Qualifications

Sample	Ortho-phosphate (mgL)	Total Phosphate (mg/L)	Criteria	Qualification Code
RB06T-GRW	0.060 J	0.010 UJ	|Diff|>2xRL	J TvP-I Or UJ TvP-I
RB07T-GRW	0.23 J	0.010 UJ		
RB08T-GRW	0.21 J	0.010 UJ		
MW-12-T01N-GRW	0.11 J	0.068 J		
MW-13-T01N-GRW	0.38 J	0.010 UJ		
MW-14-T01N-GRW	0.080 J	0.010 UJ		
MW-17-T01N-GRW	0.40 J	0.012 J		
MW-15-T01N-GRW (Zn)	544 J	14.0 UJ		

Table 1.4
Field Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB06T-GRW	04/03/03	Total Dissolved Solids	32.0	10.0
		Bicarbonate Alkalinity	2.8	1.0
		Total Alkalinity	2.8	1.0
		Ammonia-Nitrogen	0.074	0.040
		Orthophosphate-P	0.060 J	0.010
RB07T-GRW	04/03/03	Total Dissolved Solids	6.0 J	10.0
		Total Suspended Solids	2.4	0.50
		Bicarbonate Alkalinity	2.8	1.0
		Total Alkalinity	2.8	1.0
		Ammonia-Nitrogen	0.11	0.040
		Orthophosphate-P	0.23 J	0.010
RB07D-GRW	04/03/03	Chromium	1.4	1.0
RB08T-GRW	04/03/03	Total Dissolved Solids	20.0 J	10.0
		Total Suspended Solids	20.5	0.50
		Chloride	4.4	0.40
		Nitrate as N	0.56 J	0.40
		Bicarbonate Alkalinity	2.7	1.0
		Total Alkalinity	2.7	1.0
		Ammonia-Nitrogen	0.13	0.040
		Orthophosphate-P	0.21 J	0.010
		Chromium	1.0	1.0
RB08D-GRW	04/03/03	Chromium	1.1	1.0
FB02T-GRW	04/03/03	Chloroform	0.003	0.010
		Bis(2-Ethylhexyl)phthalate	0.008	0.010

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.5a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% RSD >30%	Action	Qualification and Qualification Codes
VOC	04/07/03 (1234)	2-Hexanone	50.0	Results for this analyte in all samples were qualified as estimated.	J ICAL-I Or UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.5b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
SVOC	04/15/03 (0751)	2,4-Dinitrophenol	26.7	All sample results were qualified as estimated	UJ CCAL-I
		3,3'Dichlorobenzidine	34.4		

CCAL = Continuing Calibration %D = Percent Difference

Table 1.6
Initial Calibration Verification Results For Method Spike
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	Analyte	% Recovery	QC Limits	Qualification Codes
SVOC	2,4-Dimethylphenol	64.42	75-125	UJ ICV-L
	3-Nitroaniline	66.06		
	2,4-Dinitrophenol	66.72		
	4-Nitrophenol	71.38		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT079C Sampling Event: April 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 06/30/03

Peer Reviewer: Alan Roberts Date Completed: 07/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	pH	Conductivity
MMW-40A-T01N-GRW	SA	522233	MMW40AT01NGRW MMW40AT01NGR	W	X	X	X	X	X		
MMW-40A-D01N-GRW	SA	522234		W	X						
MMW-19B-T01N-GRW	SA	522235	MMW19BT01NGR	W	X	X			X	X	X
MMW-19B-D01N-GRW	SA	522236		W	X						
MMW-35B-T01N-GRW	SA	522237	MMW35BT01NGRW MMW35BT01NGR	W	X	X	X	X	X	X	X
MMW-35B-D01N-GRW	SA	522238		W	X						
MMW-29B-T01N-GRW	SA	522239	MMW29BT01NGR	W	X	X			X	X	X
MMW-29B-D01N-GRW	SA	522240		W	X						
MMW-31B-T01N-GRW	SA	522241	MMW31BT01NGR	W	X	X			X	X	X
MMW-31B-D01N-GRW	SA	522242		W	X						
MMW-32B-T01N-GRW	SA	522243	MMW32BT01NGR	W	X	X			X	X	X
MMW-32B-D01N-GRW	SA	522244		W	X						
MMW-30B-T01N-GRW	SA	522245	MMW30BT01NGR	W	X	X			X	X	X
MMW-30B-D01N-GRW	SA	522246		W	X						
MMW-10B-T01N-GRW	SA	522247	MMW10BT01NGR	W	X	X			X	X	X
MMW-10B-D01N-GRW	SA	522248		W	X						
MMW-18B-T01N-GRW	SA	522249	MWW18BT01NGR	W	X	X			X	X	X
MMW-18B-D01N-GRW	SA	522250		W	X						
MMW-3-T01N-GRW	SA	522251		W	X	X				X	X
MMW-3-D01N-GRW	SA	522252		W	X						
FB04T-GRW	FB	255253		W					X		
TB176-GRW	TB	255254		W			X				
TB170-GRW	TB	255255		W			X				

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

____ Data are usable with qualification (noted below).

__X__ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

The laboratory case narrative noted the analyst observed a color change to yellow instead of the expected blue during the orthophosphate analysis of sample MMW-30B-T01N-GRW. The orthophosphate evaluation is done using a direct colorimetric analysis procedure (method # 365.2). The reagant is added to the original water sample and allowed to sit for an allotted amount of time. The sample is then analyzed via a spectrophotometer, the %T at 650nm is used to calculate the concentration from the calibration curve. Only orthophosphate forms a blue color in this test. Due to the fact that the intensity of the blue color is used to evaluate the presence and concentration of orthophosphate, the lack of blue color upon the addition of the reagant would indicate the lack of orthophosphate. The color change to yellow instead of blue could be the result of interferences. The method mentions if arsenate is present in concentrations greater than phosphorus, this should be considered, as arsenate is determined similarly. The concentration of arsenic in this sample was 32.9 µg/L. In addition, the total phosphorus concentration for this sample was reported at 0.079 mg/L, much lower than the orthophosphate concentration of 0.48 mg/L reported. The orthophosphate result for sample MMW-30B-T01N-GRW has been determined to be unusable and rejected (R) due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW079, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified by the laboratory on the quantitation reports. Included in the data package were the extracted ion current profiles.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, samples MMW-35B-T01N-GRW and MMW-30B-T01N-GRW for cyanide analysis were received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect results for these samples were qualified as estimated (UJ), with an indeterminate bias direction. The laboratory log-in sheet noted the VOC analyses for TB169-GRW and MMW-30B-T01N-GRW were canceled at the clients request. Sample TB176-GRW was incorrectly labeled as TB175-GRW on the chain of custody sheet.
Holding Times	No	The laboratory case narrative noted the nitrate analyses for samples MMW-18B-T01N-GRW and MMW-3-T01N-GRW were accomplished three days beyond the prescribed analytical holding time due to a malfunction for the IC instrument autosampler device. The majority of the remaining nitrate samples, in addition to nitrite and orthophosphate samples were run several hours beyond the holding time of 48 hours. The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken nine days after sampling and seven days beyond log-in. The pH for all samples was measured approximately eight hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKE4. TICs in method blanks are not considered to be reportable as TICs for samples and such identification as TICs were rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value. No qualification of organic data (volatile or semivolatile) was necessary on the basis of method blank detections of target analytes.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (B) MMW-40A-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery of surrogate compound Phenol-d5 in the semivolatile analysis of sample E4LCS was 112%, outside the acceptance range limit of 10-110%. No qualification of associated data was necessary due to the fact that the 3 remaining acid fraction surrogate recoveries were within acceptable ranges. The surrogate recovery of surrogate compound Terphenyl-d14 in the semivolatile analysis of sample E4LCS was 150%, outside the acceptance range limit of 33-141%. No qualification of associated data was necessary due to the fact that the 3 remaining base/neutral fraction surrogate recoveries were within acceptable ranges. The surrogate recovery of 1,2-Dinitrobenzene for the explosive analysis was high in sample MMW-30B-T01N-GRW. The laboratory case narrative noted the surrogate monitoring compound exceeded control criteria on both the LC-18 and CN columns due to the presence of interference related to the sample

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		matrix. This compound was recovered at 159% on the first column and at 492% on the confirmation column. The positive results for this sample (RDX: 2.3ug/L, and 2,4,6-Trinitrotoluene: 4.5ug/L) were qualified as estimated at the reported concentrations. The serial dilution analysis on sample MMW-40A-T01N-GRW was not applicable for 23 of the 24 metal analytes, as the initial sample result for only one analyte (calcium) was sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent difference between the initial sample result and the serial dilution result (5x), was compared to an evaluation criteria of ±10% for molybdenum. The reported % difference for molybdenum was 1.6%, meeting acceptance criteria. The orthophosphate concentration of 0.48 mg/L in sample MMW-30B-T01N-GRW exceeded the associated total phosphorus concentration of 0.079 mg/L. Due to the fact that both concentrations were greater than 5x the RL (0.010 mg/L), the percent difference between the two values was compared to an evaluation criterion of 30%. The calculated percent difference between these two values was 508%. Accordingly, the phosphorus result was qualified as estimated (J) with an indeterminate direction of bias. The orthophosphate result was already rejected due to the inability to verify its presence. The iron concentration of 1180 µg/L in the filtrate (dissolved) sample MMW-30B-D01N-GRW was greater than the non-detected iron RL of 422 µg/L in the corresponding total metals sample, MMW-30B-T01N-GRW. Due to the fact that both values were not greater than 5x the RL, the absolute difference between the two results was compared to an evaluation criterion of 2x the RL (adjusted for a dilution factor of 10 = 844 µg/L). Accordingly, the iron results for both samples were qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. The laboratory case narrative noted all samples in this delivery group exhibited ion balance percent differences within the acceptance range. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5, with the exception of samples MMW-40A-T/D01N-GRW, which reported a TDS ratio of 1.66. Due to the fact that the TDS calculated was greater than the TDS measured and the cation/anion balance was within the acceptance criteria, the TDS results for sample MMW-40A-T01N-GRW was qualified as estimated (J) with a low bias direction and qualifier code of "TvP".
Field QC • Field Duplicate • Rinsate Blank • Field Blank FB04T-GRW • Trip Blank TB176-GRW TB170-GRW	Yes	All results for both trip blanks and the field blank analyzed with this data package were nondetect. The Field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial Calibration • VOCs/SVOCs: Continuing Calibration • SVOC: Initial Calibration Verification Tables 1.3a and 1.3b summarized the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. Upon review of the summary forms, it was noted that there were several semivolatile organic compounds recovered above the QC limits, indicating a potential high bias in the reporting of these analyte results. Table 1.4 summarizes the percent recoveries and the QC limits established by the laboratory. No target analytes were detected in any of the associated field and therefore did not require qualification. Table 1.5 summarizes qualifications on the basis of initial calibration verification for semivolatile analytes in all SVOC samples.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho P	Conductivity	pH
MMW-40A-T01N-GRW	2.0 J	0.0050 UJ	0.11 J	1020 J	6.5 J
MMW-19B-T01N-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	2570 J	6.9 J
MMW-35B-T01N-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	3090 J	6.9 J
MMW-29B-T01N-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	1060 J	7.2 J
MMW-31B-T01N-GRW	---	0.0050 UJ	0.033 J	2910 J	6.7 J
MMW-32B-T01N-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	2690 J	6.9 J
MMW-30B-T01N-GRW	---	---	---	2460 J	7.2 J
MMW-10B-T01N-GRW	---	---	---	2500 J	6.2 J
MMW-18B-T01N-GRW	0.83 J	---	---	2830 J	7.0 J
MMW-3-T01N-GRW	0.40 UJ	---	---	2450 J	7.0 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P)	80.4	116.6	80.7	55.1/-125.0*	-250.5*	---	83.390	42.6	MMW-18B-D01N-GRW MMW-3-D/T01N-GRW	UJ CCB-L
Antimony (MS)	0.7	0.5	0.6	---	---	---	0.649	0.30	MMW-40A-T01N-GRW	U MB,CCB-I
Beryllium (P)	1.5	1.7	1.4	1.8	---	---	1.513	0.30	MMW-18B-D01N-GRW MMW-19B-D/T01N-GRW MMW-29B-D/T01N-GRW MMW-30B-D/T01N-GRW MMW-32B-D/T01N-GRW MMW-3-D/T01N-GRW MMW-40A-D/T01N-GRW	U MB,CCB-I
Copper (P)	-8.7	-10.5	-7.9	-6.6	---	---	-8.140	1.5	All samples with the **exception** of: MMW-10B-D/T01N-GRW MMW-18B-T01N-GRW	UJ MB,CCB-L
Chromium (P)	1.2	---	---	---	---	---	---	1.0	MMW-35B-D/T01N-GRW	U CCB-I
Lead (P)	1.8	2.6	---	---	---	---	---	1.4	None of the samples were qualified as all lead results were reported off of the MS run and were therefore not associated with CCBs or MB (ICP-5) detections.	---
Nickel (P)	---	---	---	---	---	---	-3.039	3.0	MMW-29B-D/T01N-GRW MMW-30B-D/T01N-GRW MMW-32B-D/T01N-GRW MMW-3-D01N-GRW MMW-40A-D/T01N-GRW	J MB-L or UJ MB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

*CCB aluminum detection from ICAP 5, for which the two samples qualified were applicable to.

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% RSD >30%	Action	Qualification and Qualification Codes
VOC	04/07/03 (1234)	2-Hexanone	50.0	Results for this analyte in all samples were qualified as estimated.	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.3b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
VOC	04/11/03 (0625)	2-Hexanone	62.3	All sample results were qualified as estimated	UJ CCAL-I
SVOC	04/15/03 (0751)	2,4-Dinitrophenol	26.7	MMW-40A-T01N-GRW	
		3,3'Dichlorobenzidine	34.4		
SVOC	04/16/03 (0628)	2,4-Dinitrophenol	39.1	MMW-35B-T01N-GRW	
		3,3'Dichlorobenzidine	28.7		

CCAL = Continuing Calibration %D = Percent Difference

Table 1.4
LCS/D Target Analyte Recoveries

Compound	LCS %R	LCSD %R	QC Limits* (% range)
4-Chloro-3-Methylphenol	127	105	23-97
2,4-Dinitrotoluene	102	84	24-96
4-Nitrophenol	123	105	10-80
Pentachlorophenol	121	108	9-103
Pyrene	136	98	26-127

*QC limits were established by the laboratory on the basis of historical data

Table 1.5
Initial Calibration Verification Results For Method Spike
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	Analyte	% Recovery	QC Limits	Qualification Codes
SVOC	2,4-Dimethylphenol	64.42	75-125	UJ ICV-L
	3-Nitroaniline	66.06		
	2,4-Dinitrophenol	66.72		
	4-Nitrophenol	71.38		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT080C Sampling Event: April 2003

Matrix: Solid __Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 07/02/03

Peer Reviewer: Alan Roberts Date Completed: 07/10/01

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	pH	Conductivity
MMW-25B-T01N-GRW	SA	522280	MMW25BT01NGR	W	X	X			X	X	X
MMW-25B-D01N-GRW	SA	522281		W	X						
MMW-42B-T01N-GRW	SA	522282		W	X	X				X	X
MMW-42B-D01N-GRW	SA	522283		W	X						
MMW-2-T01N-GRW	SA	522284		W	X	X				X	X
MMW-2-D01N-GRW	SA	522285		W	X						
MMW-8A-T01N-GRW	SA	522286	MW8AT01NGRW MMW8AT01NGRW	W	X	X	X	X	X	X	X
MMW-8A-D01N-GRW	SA	522287		W	X						
RB05T-GRW	RB	522288		W	X	X			X	X	X
TB172-GRW	TB	522289		W			X				
RB04T-GRW	RB	522450		W	X	X			X	X	X
RB04D-GRW	RB	522451		W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW080, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified by the library on the quantitation reports. Included in the data package were the extracted ion current profiles.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, sample MMW-42B-T01N-GRW for cyanide analysis was received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect result for this sample was qualified as estimated (UJ), with an indeterminate bias direction. The laboratory log-in sheet noted that samples MMW-25B-T01N-GRW and RB05T-GRW were not marked for pH and conductivity on the chain of custody. Upon sample log-in these samples were marked in for these analyses.
Holding Times	No	All nitrate analyses were run three to four days beyond the prescribed analytical holding-time of 48 hours and were accordingly qualified as estimated (J/UJ). In addition, the majority of nitrite and orthophosphate analyses were run several hours beyond the 48-hour holding time and were therefore qualified as estimated (J/UJ). The laboratory case narrative noted the original TDS analysis run on sample MMW-25B-T01N-GRW resulted in a ratio outside the specified range of 0.5-1.5. According to the laboratory, sample MMW-25B-T01N was re-analyzed for TDS, yielding results within the acceptance limit (presented with the data) 37 days beyond the prescribed analytical holding time of seven days. Upon review and comparison of the sampling date and analytical run date for the re-analysis, sample MMW-25B-T01N-GRW was analyzed 58 days beyond the prescribed analytical holding time. The TDS for this sample was qualified as estimated (J). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken nine days after sampling and seven days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKE4. TICs in method blanks are not considered to be reportable as TICs for samples and such identifications as TICs were rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value. No qualification of organic target analytes (volatile or semivolatile) was necessary on the basis of method blank detections.
Matrix QC • MS/MSD • PDS • LD	Yes	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MMW-25B-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery of surrogate compound Phenol-d5 in the semivolatile analysis of sample E4LCS was 112%, outside the acceptance range limit of 10-110%. No qualification of associated data was necessary due to the fact that the 3 remaining acid fraction surrogate recoveries were within acceptable ranges. The surrogate recovery of surrogate compound Terphenyl-d14 in the semivolatile analysis of sample E4LCS was 150%, outside the acceptance range limit of 33-141%. No qualification of associated data was necessary due to the fact that the 3 remaining base fraction surrogate recoveries were within acceptable ranges. The internal standard recovery of ^{89}Y was high for the ICPMS analyses of samples MMW-2-T01N-GRW and MMW-2-D01N-GRW. Accordingly, molybdenum results for these samples, as verified by the run-logs, were reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution analysis on sample MMW-25B-T01N-GRW was not applicable for 23 of the 24 metal analytes, as the initial sample results for only one analyte (calcium) was sufficiently larger (x50) than the IDL, (adjusted for a ten-fold dilution). The percent difference between the initial sample result and the five-fold serial dilution result was compared to an evaluation criteria of ±10%. The reported % difference for calcium was 13.9%. Accordingly, the calcium result for the parent samples in this delivery group was qualified as estimated (J) with a high bias direction. The serial dilution results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. The potassium concentration of 6960 µg/L in the filtrate (dissolved) sample MMW-2-D01N-GRW was greater than the potassium concentration of 5010 µg/L in the corresponding total metals sample, MMW-2-T01N-GRW. Due to the fact that both values were greater than 5x the RL (1.4 µg/L), the percent difference was compared to an evaluation criterion of 30%. The percent difference between these two values was calculated as 38.9 %. Accordingly, the potassium results for both samples were qualified as estimated (J) with an indeterminate direction of bias. The arsenic concentration of 2.8 µg/L in the filtrate (dissolved) sample MMW-2-D01N-GRW was greater than the arsenic concentration of 0.89

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		µg/L in the corresponding total metals sample, MMW-2-T01N-GRW. Due to the fact that both values were not greater than 5x the RL (0.20 µg/L), the absolute difference between was compared to an evaluation criterion of ±2xRL. Accordingly, the arsenic results for both samples were qualified as estimated (J) with an indeterminate direction of bias. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion with the exception of the rinsante blank sample RB-04T/D-SFW, which reported an anion/cation percent difference of 60.44%. The concentrations in this sample were low enough that the reporting limits controlled the calculations. The balance was therefore not an appropriate measure of accuracy. No qualification was considered necessary. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank RB04T-GRW RB04D-GRW RB05T-GRW • Field Blank • Trip Blank TB172-GRW	Yes	The Field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Table 1.3 summarizes the detections for the three rinsate samples presented with this data package.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial Calibration • VOCs/SVOCs: Continuing Calibration • SVOC: Initial Calibration Verification Tables 1.4a and 1.4b summarized the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. Upon review of the summary forms, it was noted that there were several semivolatile organic compounds recovered above the QC limits, indicating a potential high bias in the reporting of these analyte results. No target analytes were detected in any of the associated field sample and therefore qualification was not necessary. Table 1.5 summarizes qualifications on the basis of initial calibration verification for semivolatile analytes in all SVOC samples.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho P	Conductivity	pH	TDS
MMW-25B-T01N-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	2410 J	7.2 J	2230 J
MMW-42B-T01N-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	2900 J	7.0 J	---
MMW-2-T01N-GRW	0.40 UJ	---	---	2520 J	6.4 J	---
MMW-8A-T01N-GRW	0.40 UJ	---	---	2480 J	7.0 J	---
RB05T-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	5.9 J	6.7 J	---
RB04T-GRW	0.40 UJ	---	---	1.8 J	5.2 J	---

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS)	0.6	0.5	0.6	0.5	0.6	-0.690/ -0.697		All samples	UJ MB-L Or UJ MB,CCB-L
Aluminum (P)	---	---	----	-261.6	-261.8	---	42.6	None of the samples were associated with CCB4 or CCB5	---
Beryllium (P)	---	0.3	0.4	0.5	---	---	0.3	All Be results for samples applicable to these CCBs (RB04T/D-GRW) were nondetect	---
Molybdenum (P)	---	---	---	---	---	1.791	1.6	MMW-42B-D01N-GRW MMW-42B-T01N-GRW MMW-8A-D01N-GRW MMW-8A-T01N-GRW RB04T-GRW	U MB-I
Potassium (P)	425.5	---	---	---	---	---	325.5	All sample results were sufficiently larger (>5x) than detected in CCB1	---

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Field Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB04T-GRW	04/07/03	Total Dissolved Solids (TDS)	22.0	10.0
		Total Suspended Solids (TSS)	0.80	0.50
		Bicarbonate Alkalinity	3.0	1.0
		Total Alkalinity	3.0	1.0
		Ammonia-Nitrogen	0.054	0.040
RB05T-GRW	04/06/03	Total Dissolved Solids (TDS)	50.0	10.0
		Bicarbonate Alkalinity	2.9	1.0
		Total Alkalinity	2.9	1.0
		Ammonia-Nitrogen	0.046	0.040
RB04D-GRW	04/06/03	None	---	---

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.4a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Analyses	ICAL Date/Time	Analyte	% RSD >30%	Action	Qualification and Qualification Codes
VOC	04/07/03 (1234)	2-Hexanone	50.0	MMW-8A-T01N-GRW TB172-GRW	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.4b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
VOC	04/11/03 (0625)	2-Hexanone	62.3	MMW-8A-T01N-GRW TB172-GRW	UJ CCAL-I
SVOC	04/15/03 (0751)	2,4-Dinitrophenol	26.7	No sample in the package was associated with this calibration event	
		3,3'-Dichlorobenzidine	34.4		
SVOC	04/16/03 (0628)	2,4-Dinitrophenol	39.1	MMW-8A-T01N-GRW	
		3,3'-Dichlorobenzidine	28.7		

CCAL = Continuing Calibration %D = Percent Difference

Table 1.5
Initial Calibration Verification Results For Method Spike
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	Analyte	% Recovery	QC Limits	Qualification Codes
SVOC	2,4-Dimethylphenol	64.42	75-125	UJ ICV-L
	3-Nitroaniline	66.06		
	2,4-Dinitrophenol	66.72		
	4-Nitrophenol	71.38		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT081A Sampling Event: April 2003

Matrix: Solid ___Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 07/14/03

Peer Reviewer: Stacey Coker/Alan Roberts Date Completed: 07/17/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	pH	Conductivity
MMW-48A-T01N-GRW	SA	522399	48AT01NGRW MMW48AT01	W	X	X	X	X	X	X	X
MMW-48A-D01N-GRW	SA	522400		W	X						
MMW-8B-T01N-GRW	SA	522401	MMW8BT01NGRW	W	X	X	X	X	X	X	X
MMW-8B-D01N-GRW	SA	522402		W	X						
MMW-42A-T01N-GRW	SA	522403		W	X	X				X	X
MMW-42A-D01N-GRW	SA	522404		W	X						
P-2-T01N-GRW	SA	522405	P2T01NGRW	W	X	X	X	X	X	X	X
P-2-D01N-GRW	SA	522406		W	X						
P-3-T01N-GRW	SA	522407		W	X	X			X	X	X
P-3-D01N-GRW	SA	522408		W	X						
MMW-44A-T01N-GRW	SA	522409	MW44AT01NGRW MMW44AT01NGR	W	X	X	X	X	X	X	X
MMW-44A-D01N-GRW	SA	522410		W	X						
MMW-36B-T01N-GRW	SA	522411	MW36BT01NGRW MMW36BT01NGR	W	X	X	X	X	X	X	X
MMW-36B-D01N-GRW	SA	522412		W	X						
MMW-47A-T01N-GRW	SA	522413	MW47AT01NGRW MMW47AT01NGR	W	X	X	X	X	X	X	X
MMW-47A-D01N-GRW	SA	522414		W	X						
P-1-T01N-GRW	SA	522415		W	X	X	X	X	X	X	X
P-1-D01N-GRW	SA	522416		W	X						
MMW-47A-T01D-GRW	FD	522417	MW47AT01DGRW MMW47T01DGR	W	X	X	X	X	X	X	X
MMW-47A-D01D-GRW	FD	522418		W	X						
MMW-30B-T01N-GRW	SA	522419	MW30BT01NGRW	W			X				
TB155-GRW	TB	522420		W			X				
TB200-GRW	TB	522421		W			X				
TB168-GRW	TB	522422		W			X				
TB166-GRW	TB	522423		W			X				

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	pH	Conductivity
TB171-GRW	TB	522424		W			X				
TB174-GRW	TB	522425		W			X				

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW081A, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified by the laboratory on the quantitation reports. Included in the data package were the extracted ion current profiles.

The laboratory case narrative noted the ICP6 analytical sequence during the metals analyses exhibited ICSA recoveries that caused the lab to suspect the incorrect ICSA solution was analyzed. Therefore, the analytical sequence in question only reported boron, as boron was not in the ICSA solution.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The following comments were noted by the laboratory on the log-in sheet: • Sample MMW-30B-T01N-GRW was received for the analysis of volatiles only. Only one vial was received for sample MMW-42A-T01N-GRW. • Only one vial was received for the TOC analysis of sample MMW-42A-T01N-GRW. None of the above comments affected data quality.
Holding Times	No	The laboratory case narrative noted the nitrate analyses for all samples in this delivery group were accomplished seven days beyond the prescribed analytical holding time due to a malfunction for the IC instrument autosampler device. All nitrate analyses were accordingly qualified as estimated (J/UJ). In addition, the majority of nitrite and orthophosphate analyses were run several hours beyond the 48-hour holding time and were therefore qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken nine days after sampling and seven days beyond log-in. The pH for all samples was measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. An unknown trichloropropene was reported as a tentatively identified compound in the semivolatile blank SBLKG2. TICs in method blanks are not considered to be reportable as TICs for samples and such identifications as TICs were rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value. No qualification of organic target analytes (volatile or semivolatile) was necessary on the basis of method blank detections.
Matrix QC • MS/MSD MMW-48A-T01N-GRWMS/D MMW-48A-D01N-GRWMS P-2-T01N-GRWMS/D P-2-D01N-GRWMS • PDS MMW-48A-T/D01N-GRWA P-2-T/D01N-GRWA • LD MMW-48A-T01N-GRWREP MMW-48A-D01N-GRWREP P-2-T01N-GRWREP P-2-D01N-GRWREP	No	The inorganics analysis of the matrix spike associated with sample MMW-48A-T01N-GRW yielded percent recoveries for bicarbonate alkalinity (71.8%), total alkalinity (71.8%), orthophosphate (36.4), sulfate (144.0%), and total organic carbon (26.9%) that were outside the established control limits of 75-125%. The analyte concentration of orthophosphate was greater than 4x the spike concentration and consequently was considered inappropriate for assessing accuracy for sample specific matrix affects. The remaining analyte matrix spike recoveries resulted in the qualification of the inorganic analytes in the parent sample as estimated (J), with varying directions of bias. The inorganics analysis of the matrix spike associated with sample P-2-T01N-GRW yielded percent recoveries for bicarbonate alkalinity (19.8%), total alkalinity (19.8%), sulfate (144.8%), and total organic carbon (1936%) that were outside the established control limits of 75-125%. These four analytes were qualified in the parent sample as estimated, with varying directions of bias.

Review Parameter	Criteria Met?	Comments
		Table 1.3 summarizes the inorganic and metal analytes recovered outside the limits, with the associated percent recoveries and any qualification codes assigned to the parent samples. The laboratory case narrative noted the semivolatile organics analyses of the blank spike samples associated with this delivery group yielded generally acceptable recoveries with the exception of select compounds that marginally exceeded control criteria. Upon review of the summary data sheets, it was noted that no target compounds were recovered outside the acceptance range set forth by the laboratory. 4-Nitrophenol was recovered in the MS and MSD of sample MMW-48A-T01N-GRW at 89% and 85%, respectively. These recoveries were above the QC limits established by the laboratory of 10-80%. The matrix spike recoveries of this target compound indicate a greater accuracy than the historical QC limits. Pentachlorophenol was recovered in the MSD of the same sample at 105%, marginally above the QC limits of 9-103%. This recovery is considered acceptable; therefore no qualifications were necesssary. The nitroaromatics analyses of the matrix spikes associated with this delivery group yielded generally acceptable recoveries with the exception of PYX, which recovered 0% for the MS and 12% for the MSD for sample MMW-48A-T01N-GRW. The laboratory has not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Upon review of the raw data sheets, it was verified that PYX was recovered at 0.35 µg/L (8.75%) on the first column and 0.1106 µg/L (0.27%) on the second column. The recovery on the confirmation column was less than half the RL and therefore could not verify the presence of PYX. Consequently, PYX was qualified as unusable (R) in the parent sample. The nitroaromatic analysis of the matrix spike sample P-2-T01N-GRW yielded PYX recoveries below the default control limits. PYX was recovered in the MS at 9% and in the MSD at 10%. The low matrix spike recoveries indicated a potential low bias in the reporting of PYX results. The 9% recovery was marginally below the 10% limit for rejecting the usability of the data. The PYX result for sample P-2-T01N-GRW was qualified as estimated (UJ) in the parent sample, with a low bias direction. RDX was recovered at 122% in both the MS and MSD for sample MMW-48A-T01N-GRW, above the QC limit of 81-116%, indicating a potential high bias in the results. RDX results for the parent sample were not qualified due to the fact the RDX was reported as nondetect. The laboratory duplicate analysis resulted in the qualification of bicarbonate alkalinity, total alkalinity, and orthophosphate in the parent sample (MMW-48A-T01N-GRW) as estimated (J), with an indeterminate direction of bias and a qualifier code of "D". Both bicarbonate alkalinity (16.3 mg/L) and total alkalinity (16.3 mg/L) results for the initial and duplicate analyses resulted in concentrations in excess of five times the reporting limit (5.0 mg/L). Accordingly, the Relative Percent Difference (RPD) was compared to an evaluation criterion of ≤20%. Both analytes reported a RPD of 21% and were consequently qualified. The orthophosphate sample (0.56 mg/L) and duplicate (0.46 mg/L) results were greater than 5x the RL (0.050 mg/L). As the RPD for orthophosphate was 20%, the orthophosphate result was qualified. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (A) MMW-48A-T/D01N-GRW P-2-T/D01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery of the surrogate compound 1,2-Dinitrobenzene in the explosives analysis of sample MMW-36B-T01N-GRW was 121%, outside the acceptance range limit of 85-116%. No qualification of associated data was necessary due to the fact that all results for this sample were nondetect. The internal standard recovery of ^{89}Y was high for the ICPMS analyses of samples P-3-T01N-HRW, P-3-D01N-GRW, MMW-44A-T01N-GRE, and MMW-44A-D01N-GRW. Accordingly, molybdenum results for these

Review Parameter	Criteria Met?	Comments
		samples, as verified by the run-logs, were reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution analyses on samples MMW-48A-T01N-GRW and MMW-48A-D01N-GRW were not applicable for 18 of the 24 metal analytes. The initial sample results for six analytes were sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent differences between the initial sample results and the five-fold serial dilution results for the six analytes in each sample were compared to an evaluation criteria of ±10%. All reported % differences were less than 10% for the six metal analytes. The serial dilution analyses on samples P-2-T01N-GRW and P-2-D01N-GRW were not applicable for 21 of the 24 metal analytes. All percent differences between the initial sample results and the five-fold serial dilution results for the three analytes in each sample were less than 10%. No qualification of results on the basis of serial dilution analyses was considered necessary. The serial dilution results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5, with the exception of MMW-44A-D/T01N-GRW, which yielded a TDS ratio of 1.56. Due to the fact that the TDS calculated was greater than the TDS measured and the cation/anion balance was within the acceptance criteria, the TDS result for sample MMW-44A-T01N-GRW was qualified as estimated (J) with a low bias direction and qualifier code of "TvP". The copper results for samples MMW-47A-D01D-GRW and MMW-47A-T01D-GRW were qualified as estimated (J/UJ TVP-I) because the dissolved copper result was greater than the total alkalinity results.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank TB155-GRW TB166-GRW TB168-GRW TB171-GRW TB174-GRW TB200-GRW	Yes	Results for all trip blanks were nondetect. The Field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters	No	Detected organic analytes with concentrations between the MDL and RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial Calibration

Review Parameter	Criteria Met?	Comments
		• VOCs/SVOCs: Continuing Calibration • Metals: Interference Check Sample Results • SVOCs: Initial Calibration Verification Tables 1.4a and 1.4b summarized the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Table 1.5 summarizes qualifications on the basis of initial calibration verification for semivolatile analytes in all SVOC samples.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho P	Conductivity	pH
MMW-48A-T01N-GRW	0.41 J	---	---	3340 J	6.2 J
MMW-8B-T01N-GRW	2.9 J	---	---	2370 J	5.6 J
MMW-42A-T01N-GRW	0.57 J	0.0050 UJ	0.015 J	2380 J	5.9 J
P-2-T01N-GRW	2.7 J	0.0050 UJ	0.010 UJ	1380 J	3.8 J
P-3-T01N-GRW	2.6 J	---	---	1350 J	4.6 J
MMW-44A-T01N-GRW	0.58 J	0.0050 UJ	0.22 J	3190 J	4.7 J
MMW-36B-T01N-GRW	0.20 J	---	---	3860 J	4.8 J
MMW-47A-T01N-GRW	2.4 J	0.0050 UJ	0.24 J	1260 J	4.6 J
P-1-T01N-GRW	3.3 J	0.0050 UJ	0.050 J	1620 J	4.1 J
MMW-47A-T01N-GRW	2.3 J	0.0050 UJ	0.010 UJ	1240 J	5.0 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P)	---	---	---	---	---	-239.4	110.400	42.6	MMW-8B-D01N-GRW MMW-8B-T01N-GRW	U CCB-I or U MB-I
Antimony (MS)	1.7	2.1	1.8	1.9	1.8	---	---	0.60	MMW-48A-T01N-GRW	U CCB-I
Beryllium (P)	---	---	---	---	---	-4.8	---	0.4	None of the Be results were qualified as they were either nondetect or greater than 5x blank detection.	---
Chromium (P)	-1.5	-1.0	---	---	---	---	---	0.9	MMW-47A-D01D-GRW P-1-T01N-GRW	UJ CCB-L
Copper (P)	---	---	---	---	---	-16.5	---	2.0	None of the samples were associated with calibration event CCB6, and all samples were greater than 5x the MB detection	---
Vanadium (MS)	-0.1	---	---	---	---	---	-0.217	0.1	All samples with the **exception of:** MMW-36B-D01N-GRW MMW-36B-T01N-GRW	J MB-L Or UJ MB-L Or UJ MB,CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Inorganic and Metals Matrix Spike Results
And Parent Sample Qualifications

Analyte	% MS	PDS %R	Criteria	RL* (µg/L)	Comment	Action
MMW-48A-T01N-GRW (A)						
Bicarbonate Alkalinity	71.8	N/A	75-125%	1.0 mg/L	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery	NQ
Total Alkalinity	71.8	N/A		1.0 mg/L		
Orthophosphate	36.4	N/A		0.010 mg/L	N/A: [analyte] >4x [spike]	NQ
Sulfate	144.0	N/A		1000 mg/L	None	2430 J MS-H
Total Organic Carbon	26.9	N/A		1.0 mg/L	None	2.4 J MS-L
Aluminum	46.0	99.6	75-125%	426.0	N/A: [analyte] >4x [spike]	NQ
Iron	-29.0	109.8		422.0		
Lead	147.7	100.4		1.0	None	2.9 J MS-H
Manganese	40.0	101.6		13.0	N/A: [analyte] >4x [spike]	NQ
Zinc	64.2	93.3		39.0		
MMW-48A-D01N-GRW						
Iron	33.0	100.1	75-125%	422.0	N/A: [analyte] >4x [spike]	NQ
Manganese	68.0	95.0		13.0		
Selenium	137.8	97.9		5.0	None	NQ (ND)
P-2-T01N-GRW (A)						
Bicarbonate Alkalinity	19.8	N/A	75-125%	1.0 mg/L	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery	NQ
Total Alkalinity	19.8			1.0 mg/L		
Sulfate	144.8			250 mg/L	None	878 J MS-H
Total Organic Carbon	19.6			1.0 mg/L	None	1.4 J MS-H
Aluminum	29.5	90.9		426.0	N/A: [analyte] >4x [spike]	NQ
Manganese	-56.0	89.6		13.0		
Selenium	163.1	100.1		5.0	None	NQ (ND)
Zinc	49.4	88.4		39.0	N/A: [analyte] >4x [spike]	NQ
Cyanide	12.0	111.6		10.0	None	NQ (ND)
P-2-D01N-GRW (A)						
Aluminum	73.5		75-125%	90.6	N/A: [analyte] >4x [spike]	NQ
Manganese	46.0			87.6		
Selenium	138.5			99.1	None	NQ (ND)
Zinc	70.8			87.2	N/A: [analyte] >4x [spike]	NQ

N/A = Not Appropriate (Post digestion spike or no recalculation for MS %R required for qualitative analysis)

NQ = No Qualification

Table 1.4a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% RSD >30%	Action	Qualification and Qualification Codes
VOC	04/07/03 (1234)	2-Hexanone	50.0	All samples	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.4b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
VOC	04/10/03 (0625)	2-Hexanone	62.5	All samples	UJ CCAL-I
SVOC	04/16/03 (0628)	2,4-Dinitrophenol	39.1	No sample in the package was associated with this calibration event	
		3,3'-Dichlorobenzidine	28.7		
SVOC	04/16/03 (1728)	2,4-Dinitrophenol	52.0	All samples	
		4-Nitrophenol	39.8		
		4,6-Dinitro-2-methylphenol	33.2		
		3,3'-Dichlorobenzidine	31.9		
		Di-n-octylphthalate	33.1		
		Dibenz(a.h)anthracene	27.1		

CCAL = Continuing Calibration %D = Percent Difference

Table 1.5
Initial Calibration Verification Results For Method Spike
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	Analyte	% Recovery	QC Limits	Qualification Codes
SVOC	2,4-Dimethylphenol	64.42	75-125	UJ ICV-L
	3-Nitroaniline	66.06		
	2,4-Dinitrophenol	66.72		
	4-Nitrophenol	71.38		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT082C

Sampling Event: April 2003

Matrix: Solid __ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

LP Reviewer: Brian Olmsted

Date Completed: 02/04/04

Data Reviewer: Karen Kronoveter

Date Completed: 07/21/03

Peer Reviewer: Stacey Coker

Date Completed: 07/22/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	pH	Conductivity
MINE1-T01N-GRW	SA	522633	MINE1T01N	W	X	X	X	X	X	X	X
MINE1-D01N-GRW	SA	522634		W	X						
TB158-GRW	TB	522635		W			X				

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW082C, were all nondetect with the exception of ethyl acetate, which is a non-target analyte that had been "tentatively identified" (NJ). The associated numerical value represents its approximate value. Ethyl acetate was also reported as a tentatively identified compound in the associated sample. As this compound was found in an associated blank it was rejected as a TIC in sample MINE1-T01N-GRW.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified by the laboratory on the quantitation reports. Included in the data package were the extracted ion current profiles.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations. The laboratory noted that sodium was reported from the straight analysis instead of the 10-fold dilution due to an anomalous replicate.

The laboratory case narrative noted the nitroaromatic analysis of the blank spike sample duplicate O3LCSD yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded a recovery of 68%. The laboratory has not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ), with a low bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The laboratory case narrative noted the nitrate analysis for sample MINE1-T01N-GRW was accomplished six days beyond the prescribed analytical holding time of 48 hours due to a malfunction of the IC instrument autosampler device. The nitrate result for this sample was accordingly qualified as estimated (J). In addition, the TKN analysis of sample MINE1-T01N-GRW was completed two days beyond the prescribed holding time of 28 days. According to the case narrative and the internal chain of custody, the TKN sample was digested within the holding time. The TKN result was qualified as estimated (UJ). Nitrite in the form of nitrogen, in addition to orthophosphate as phosphorus were run several hours beyond the prescribed analytical holding time of 48 hours, and were accordingly qualified as estimated (J/UJ) in sample MINE1-T01N-GRW. The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for sample MINE1-T01N-GRW was taken eight days after sampling and six days beyond log-in. The pH for the same sample was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. An unknown trichloropropene was reported as a tentatively identified compound in the semivolatile blank SBLKG2. TICs in method blanks are not considered to be reportable as TICs for samples and such identification of this compound as a TIC was rejected. Several unknown semivolatile compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value. No qualification of organic target analytes (volatile or semivolatile) was necessary on the basis of method blank detections.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD MINE1-T01N-GRWMS/D MINE1-D01N-GRWMS/D • PDS MINE1-T01N-GRWA MINE1-D01N-GRWA • LD MINE1-T01N-GRWD MINE1-D01N-GRWD	Yes	For sample MINE1-T01N-GRW, the sulfate matrix spike recovery was 174%. This was above the established control limit of 75-125%, thereby suggesting a potential high bias. As a result, the sulfate result of 1640 mg/L was qualified as estimated with a high bias. Three metal analytes were recovered outside the control limit of 75-125% for the matrix spike analysis of sample MINE1-T01N-GRW. The analyte concentration of manganese was greater than 4x the spike concentration and consequently was considered inappropriate for assessing accuracy for sample specific matrix affects. Iron was recovered slightly above (126.8%) the control limits of 75-125%, indicating the possibility of a high bias in the reporting of iron results. Due to the fact that the iron results for the parent sample (MINE1-T01N-GRW) were nondetect, the potential of a high bias was not an issue and data qualification was not necessary. Cyanide was recovered marginally below (74.9%) the established recovery limits. Due to the fact that the percent recovery rounds to 75%, which represents the lower end of the control percentage range, no qualification of data was considered necessary. Post digestion spikes were performed on the metal analytes that did not meet the specified criterion for the initial matrix spike recoveries. All post digestion spike recoveries for these analytes were recovered within acceptance limits. The volatile organics analysis of the matrix spikes associated with sample MINE1-T01N-GRW exhibited a Relative Percent Difference (RPD) of 16% for 1,1-dichloroethene that was in excess of the laboratory's historically established RPD of 14% for this compound. The matrix spike for this sample was recovered at 96% and its duplicate reported a recovery of 82%, both percentages well within the QC limits of 61-145% established by the laboratory. Due to the fact that the individual percent recoveries for the matrix spikes were acceptable, and the RPD was only marginally above the RPD limits, it was not considered necessary to qualify any data. PYX was recovered at 68% for the matrix spike duplicate of sample MINE1-T01N-GRW. This was marginally below the laboratory's QC default limit of 70-130%. Due to the fact that the matrix spike for the same analyte was recovered at 75% and the RPD between the two results was 10%, no qualification of data was considered necessary based on MS/MSD results. However, all PYX results were qualified estimated based on LCS results. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MINE1-T01N-GRW MINE1-D01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The internal standard recovery of ^{6}Li was low for the ICPMS analysis of sample MINE1-D01N-GRW. Accordingly, the potassium result for this sample, as verified by the run-logs, was reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Two sets of serial dilution analyses were run on each sample (MINE1-T01N-GRW and MINE1-D01N-GRW) and presented with the data in this package; one for ICP-MS metals and the other for ICP analyzed metals. The serial dilution analyses on the samples was not applicable for all seven MS metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL (adjusted for dilution). The serial dilution for the ICP analyzed metals, run on sample MINE1-T01N-GRW, was not applicable to 4 of the 17 metal analytes. Initial aluminum, iron, magnesium, and potassium sample results were less than 50x the IDL, adjusted for varying dilution factors. The percent deviations between the original results and their 5-fold dilutions were compared to an evaluation criterion of ±10% for the applicable metal analytes. All

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		percent differences for the 13 analytes, for which the serial dilution analysis was applicable, were less than 10%, thereby meeting the criterion specified in the SOP (12.1). The serial dilution for the ICP analyzed metals, run on sample MINE1-D01N-GRW, was not applicable for 3 of the 17 metal analytes. The initial aluminum, iron, and potassium sample results were less than 50x the IDL, adjusted for varying dilution factors. The percent deviations between the original results and their 5-fold dilutions were compared to an evaluation criterion of ±10% for the applicable metal analytes. Three metal analytes reported percent differences greater than 10%: cadmium (11.0%), cobalt (11.5%), and nickel (12.5%). The diluted results (considered to be more accurate), were all greater than the original results, indicating potentially low bias directions for the three analytes. According, cadmium, cobalt, and zinc sample results were qualified as estimated (J/UJ) with a low bias direction. The serial dilution results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported anion/cation balances met this criterion. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank TB158-GRW	Yes	All target analytes in the trip blank associated with the volatile analyses in this package were nondetect. The field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters	N/A	
Initial Calibration	No	Tables 1.2a and 1.2b summarized the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues.
Initial/Continuing Calibration Verification	No	Four SVOC ICV method spike recoveries were below QC limits. Table 1.3 summaries the results.
Laboratory Control Sample Results	No	Refer to case narrative summary.
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1

Metal Blanks Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification code
Antimony (MS)	1.1	1.0	1.1	---	1.242	0.30	Both samples	U MB,CCB-I
Copper (P)	-3.7	-2.7	-2.6	---	---	2.4	Both samples	UJ CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% RSD >30%	Action	Qualification and Qualification Codes
VOC	04/07/03 (1234)	2-Hexanone	50.0	MINE1-T01N-GRW TB158-GRW	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.2b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
VOC	04/11/03 (0625)	2-Hexanone	62.3	MINE1-T01N-GRW TB158-GRW	UJ CCAL-I
SVOC	04/16/03 (0628)	2,4-Dinitrophenol	39.1		
		3,3'-Dichlorobenzidine	28.7		

CCAL = Continuing Calibration %D = Percent Difference

Table 1.3
Initial Calibration Verification Results For Method Spike Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	Analyte	% Recovery	QC Limits	Qualification Codes
SVOC	2,4-Dimethylphenol	64.42	75-125	UJ ICV-L
	3-Nitroaniline	66.06		
	2,4-Dinitrophenol	66.72		
	4-Nitrophenol	71.38		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT083A Sampling Event: April 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 7/8/03

Peer Reviewer: Stacey Coker Date Completed: 7/15/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
SHAFTSPRING-T01N-GRW	SA	522720	SHAFTSPRING-T01N-GR	W	X	X
SHAFTSPRING-D01N-GRW	SA	522721	SHAFTSPRING-D01N-GR	W	X	
SPRING14A-T01N-GRW	SA	522722		W	X	X
SPRING14A-D01N-GRW	SA	522723		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank

FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No,, or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	A 48-hour holding time was exceeded for nitrate as N, nitrite as N, and orthophosphate by 1-2 days. The analysis for pH and conductivity were exceeded by 2 and 11 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, cadmium, chromium, copper, and iron were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Not Applicable	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution SHAFTSPRING-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis on samples SAHFTSPRING-T01N-GRW, both pH class A, was applicable for 0 out of 24 analytes. Recovery for internal standard Y was high for the ICPMS analysis of samples SPRING14A-T01N-GRW and SPRING14A-D01N-GRW. Therefore, the molybdenum results for these samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Not Applicable	This package did not include any site-specific field quality control samples. The field quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Not Applicable	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
SHAFTSPRING-T01N-GRW	1.6 J	0.005 UJ	0.010 UJ	941 J	5.5 J
SPRING14A-T01N-GRW	9.2 J	0.005 UJ	0.010 UJ	928 J	4.9 J

Table 1.2
Blanks Detections Resulting in Data Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	EEB6 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=100	73.2						50.3	SHAFTSPRING-T01N-GRW, SHAFTSPRING-D01N-GRW	U CCB-I
Antimony (MS) DF=10				1.0	1.0	0.809	0.30	NONE	Data qualification was not necessary, as all antimony results nondetect.
Cadmium (P) DF=10						-0.533	0.5	All samples in package	UJ CCB-L
Chromium (P) DF=10						1.104	1.0	NONE	Data qualification was not necessary, as all chromium results nondetect.
Copper (P) DF=10	2.3					2.299	1.5	SHAFTSPRING-T01N-GRW, SHAFTSPRING-D01N-GRW	U CCB, MB-I
Iron (P) DF=100		44.3					31.1	NONE	Data qualification was not necessary, as all iron results nondetect.

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT084A Sampling Event: April 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brice Woodlock Date Completed: 07/01/03

Peer Reviewer: Stacey Coker Date Completed: 07/03/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	pH	Conductivity
MMW-28B-T01N-GRW	SA	522700	MMW28BT01NGR	W	X	X	X	X	X	X	X
MMW-28B-D01N-GRW	SA	522701		W	X						
MMW-7-T01N-GRW	SA	522702	MMW7-T01NGRW	W	X	X	X	X	X	X	X
MMW-7-D01N-GRW	SA	522703		W	X						
MMW-7-T01D-GRW	FD	522704	MMW7-T01DGRW	W	X	X	X	X	X	X	X
MMW-7-D01D-GRW	FD	522705		W	X						
MMW-21-T01N-GRW	SA	522706	MMW21-T01NGRW	W	X	X	X	X	X	X	X
MMW-21-D01N-GRW	SA	522707		W	X						
FB01T-GRW	FB	522708		W			X	X			
TB207-GRW	TB	522709		W			X				
TB206-GRW	TB	522710		W			X				

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The laboratory noted the metals analyses of the samples in this delivery group were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations. Cadmium, cobalt, chromium, copper, potassium, and nickel were the exception, which were reported from the 10 times dilution analysis. The results from this analysis were compared to 100 times dilution analysis and the ICP/MS analysis and were generally comparable. The reason for this exception is that in the cation/anion balance calculation, the non-detect results at the 100x dilution (i.e., elevated reporting limits) were controlling the calculation, and causing the balance to be outside of the acceptance limit. The results from the lower dilution yielded acceptable ion balance results.

During the ICP/MS analysis designated 053103-02, the CCV4 exhibited a marginally elevated recovery of the internal standard Sc. Selenium and vanadium, which are associated with this internal standard, exhibited acceptable recoveries. Additional elevated recoveries of the internal standards are discussed below.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified on the quantitation reports. Included in the data package were the extracted ion current profiles.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HB084A, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

The nitroaromatics analysis of laboratory control sample yielded a slightly low percent recovery (LCSD=62%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time; therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	On the COC listing the samples TB206-GRW, MMW-7-T01N-GRW, MMW-7-D01N-GRW, FB01T-GRW, MMW-21-D01N-GRW and MMW-21-T01N-GRW, the sample collection date was inadvertently filled out using the relinquishing date (04/09/03) rather than the sampling date (04/08/03). The correct date was used for sample log-in and evaluating holding times.
Holding Times	No	The laboratory noted the nitrate as N analyses for all of the samples in this delivery group were accomplished 1-2 days beyond the holding time due to an autosampler malfunction on the IC. No sample was analyzed beyond two times the holding time, therefore, all nitrate results are qualified estimated (J/UJ). The original Total Dissolved Solids (TDS) analyses of samples MMW-7-T01N-GRW and MMW-7-T01D-GRW, were performed within holding time and the results obtained greatly exceeded the upper limit of the method. A smaller sample volume was re-analyzed outside of holding time yielding results within 2.4% of the original analysis. The results from the re-analyses have been formally presented in this case submittal, with the data from the original analyses being presented in the raw data section of the data package.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The re-analyses agree so closely with the original results, that no qualification was considered necessary based on holding times. The laboratory noted that although the TKN analyses of the samples in this delivery group were completed one day beyond the prescribed holding time, the samples were actually digested within the holding time. The TKN result for all samples were qualified as estimated (J/UJ) for holding time. The nitrite and orthophosphate results for sample MMW-28B-T01N-GRW were run several hours beyond the 48-hour holding time. These were qualified as estimated (J/UJ) based on holding times. All results for pH and conductivity were qualified as estimated (J) based on holding times. The holding time requirement is to analyze immediately, these samples were analyzed days after sampling, thus the reason for qualification. A summary of these samples and the qualifications is presented in Table 1.1. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value. A tentatively identified compound was reported as present in the semivolatile blank SBLKG2. TICs in method blanks are not considered to be reportable as TICs for samples and such results were flagged as unusable (R). The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value. No qualification of organic data (volatile or semivolatile) was necessary on the basis of method blank detections of target analytes.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MMW-28B-T01N-GRWL • Total vs. Partial Analyses • Internal Standards • Cation/Anion Balance	No	The laboratory noted the nitroaromatics analysis of sample MMW-28B-T01N-GRW yielded a percent recovery (81%) of the surrogate monitoring compound 1,2-dinitrobenzene that was slightly below control criteria (85-116%). All results for this sample were non-detect and were qualified as estimated (UJ). The serial dilution analysis on sample MMW-28B-T01N-GRW was not applicable for all 24 metal analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL, (adjusted for dilution). It was therefore not necessary to qualify any results on the basis of serial dilutions. For sample MMW-7-T01N-GRW the ammonia result was greater than the TKN result. The results were both less than 5xRL, so the absolute difference criterion was used. The absolute difference between the samples was 2.1xRL, exceeding the acceptance limit of ≤1xRL. As such, the ammonia and TKN results for this sample were qualified as estimated (J/UJ) with an indeterminate bias. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-28B-T01N-GRW, MMW-7-T01N-GRW, MMW-7-D01N-GRW, MMW-7-T01D-GRW, MMW-7-D01D-GRW, MMW-21-T01N-GRW, and MMW-21-D01N-GRW. Therefore, the molybdenum results for these samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Tb was high for the ICPMS analysis of samples MMW-7-T01N-GRW, MMW-7-D01N-GRW, MMW-7-T01D-GRW, and

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		MMW-7-D01D-GRW. Therefore, the barium and cadmium results for these samples were reported from the trace ICP. The trace ICP barium and cadmium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The related antimony results were reported by ICPMS, therefore, were qualified as estimated (J/UJ) based on internal standards
Field QC • Field Duplicate MMW-7-T01N/D-GRW MMW-7-D01N/D-GRW • Rinsate Blank • Field Blank FB02T-GRW • Trip Blank TB206-GRW TB207-GRW	N/A	Three analytes were detected in the field blank analyzed with this data set. Table 1.3 summarizes the analytes detected and their reported concentrations. The field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Detected organic analytes with concentrations between the MDL and RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial Calibration • VOCs/SVOCs: Continuing Calibration • SVOCs: Initial Calibration Verification Tables 1.4a and 1.4b summarized the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. Table 1.5 summarizes qualifications on the basis of initial calibration verification for semivolatile analytes in all SVOC samples.

Table 1.1
Holding Time Qualifications for Inorganic

Sample	Nitrate as N	Nitrite	Ortho P	TKN	pH	Conductivity
MMW-28B-T01N-GRW	0.70 J	0.005 UJ	0.010 J	0.24 J	4.6 J	851 J
MMW-7-T01N-GRW	0.40 UJ	---	---	0.24 UJ	4.3 J	6140 J
MMW-7-T01D-GRW	0.40 UJ	---	---	0.24 UJ	4.2 J	6150 J
MMW-21-T01N-GRW	2.2 J	---	---	---	3.7 J	2410 J

Table 1.2
Method Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P)	---	73.2	---	---	---	---	---	42.6	MMW-28B-T01N-GRW MMW-28B-D01N-GRW	U CCB-I
Antimony (MS)	1.1	1.0	0.9	0.9	1.0	1.0	0.809	0.3	MMW-28B-T01N-GRW	U CCB-I
Cadmium (P)	---	---	---	---	---	---	-0.533	0.5	MMW-28B-T01N-GRW MMW-28B-D01N-GRW	UJ MB-L
Chromium (P)	---	---	---	---	---	---	1.104	1.0	MMW-21-T01N-GRW	U MB-I
Copper (P)	---	2.3	---	---	---	---	2.299	3.8	MMW-28B-T01N-GRW MMW-28B-D01N-GRW	U CCB,MB-I
Beryllium (P)	---	---	0.9	---	---	---	---	0.3	MMW-21-T01N-GRW MMW-21-D01N-GRW	U CCB-I
Nickel (P)	---	25.9	26.4	---	---	---	---	3.0	MMW-28B-T01N-GRW MMW-28B-D01N-GRW MMW-21-T01N-GRW MMW-21-D01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Field Blank Detections Resulting in Data Qualification

Blank	Collection Date	Analyte	Concentration (mg/L)	RL (mg/L)
FB01T-GRW	04/03/03	Chloroform	3.0 J	10.0
		Diethylphthalate	0.7 J	10.0
		Bis(2-ethylhexyl) phthalate	6	10.0

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.4a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% RSD >30%	Action	Qualification and Qualification Codes
VOC	04/07/03 (12:34)	2-Hexanone	50.0	Results for this analyte in all samples were qualified as estimated.	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.4b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
VOC	04/11/03 (06:25)	2-Hexanone	62.3	All sample results were qualified as estimated	UJ CCAL-I
SVOC	04/16/03 (06:28)	2,4-Dinitrophenol	39.1	All sample results were qualified as estimated	UJ CCAL-I
		3,3'-dichlorobenzidine	28.7		

CCAL = Continuing Calibration %D = Percent Difference

Table 1.5
Initial Calibration Verification Results For Method Spike
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	Analyte	% Recovery	QC Limits	Qualification Codes
SVOC	2,4-Dimethylphenol	64.42	75-125	UJ ICV-L
	3-Nitroaniline	66.06		
	2,4-Dinitrophenol	66.72		
	4-Nitrophenol	71.38		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT085A Sampling Event: April 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 6/30/03

Peer Reviewer: Alan Roberts Date Completed: 7/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses		
					Metals	Inorganics	Explosives
MMW-38A-T01N-GRW	SA	522657	MMW38AT01NGR	W	X	X	X
MMW-38A-D01N-GRW	SA	522658		W	X		
MMW-32A-T01N-GRW	SA	522659	MMW32AT01NGR	W	X	X	X
MMW-32A-D01N-GRW	SA	522660		W	X		
MMW-19A-T01N-GRW	SA	522661	MMW19AT01NGR	W	X	X	X
MMW-19A-D01N-GRW	SA	522662		W	X		
MMW-19A-T01D-GRW	FD	522663	MMW19AT01DGR	W	X	X	X
MMW-19A-D01D-GRW	FD	522664		W	X		
MMW-31A-T01N-GRW	SA	522665	MMW31AT01NGR	W	X	X	X
MMW-31A-D01N-GRW	SA	522666		W	X		
MMW-45A-T01N-GRW	SA	522667		W	X	X	
MMW-45A-D01N-GRW	SA	522668		W	X		
MMW-45B-T01N-GRW	SA	522669		W	X	X	
MMW-45B-D01N-GRW	SA	522670		W	X		
P-5C-T01N-GRW	SA	522671	P-5C-T01NGRW	W	X	X	X
P-5C-D01N-GRW	SA	522672		W	X		
P-4B-T01N-GRW	SA	522673	P-4B-T01NGRW	W	X	X	X
P-4B-D01N-GRW	SA	522674		W	X		
P-5B-T01N-GRW	SA	522675	P-5B-T01NGRW	W	X	X	X
P-5B-D01N-GRW	SA	522676		W	X		
FB05T-GRW	FB	522677		W			X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The metals analyses in this SDG were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of samples, which were determined by the field pH determinations. The exception to this was the reporting of cadmium, cobalt, chromium, copper, potassium, and nickel, which were reported from the 10 times dilution.

The nitroaromatics analysis of the laboratory control sample yielded a slightly low percent recovery (LCSD=62%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time; therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Two errors accidentally occurred in labeling the samples on the chains of custody: 1) Sample MMW-38A-T01N-GRW was inadvertently labeled MMW-48A-T01N-GRW, 2) Samples MMW-45A-T01N-GRW, and MMW-45B-T01N-GRW were inadvertently labeled MMW-45A and MMW-45B. For both of these cases, the laboratory was contacted and the correction was made so that theses samples were logged in with the correct field IDs.
Holding Times	No	A 48-hour holding time was exceeded for nitrate as N by 6 days and less than 48 hours for nitrite as N, and orthophosphate. A 7-day holding time was exceeded by 56 days for a reanalyses of TDS. A 28-day holding time was exceeded by 1 day for TKN, and 24 days for reanalyses of fluoride. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Antimony, beryllium, iron, lead, manganese, and selenium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Not Applicable	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution MMW-31A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery for the explosive analysis was low in sample MMW-31A-T01N-GRW. The recovery of 1,2-dinitrobenzene was 82%. This recovery is outside the acceptance range of 85%-116%, suggesting a potential low bias in the associated sample results. Because the surrogate recovery is lower than the acceptance limit but greater than 10%, all explosive results for sample MMW-31A-T01N-GRW were qualified as estimated (UJ). The serial dilution analyses were conducted on samples MMW-38A-T01N-GRW, pH class A. The percent difference between the original result and result for the diluted sample for beryllium, and nickel did not satisfy the ≤10% criterion and the result for the parent sample was qualified as estimated (J/UJ). Table 1.3 summarizes these results. The serial dilution results for each sampling event will be evaluated collectively and any resultant/additional data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-38A-T01N-GRW, MMW-38A-D01N-GRW, MMW-45B-T01N-GRW, MMW-45B-D01N-GRW, P-5C-T01N-GRW, P-5C-D01N-GRW, P-4B-T01N-GRW, and P-4B-D01N-GRW. Therefore, the molybdenum results for these samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For samples MMW-19A-T01N-GRW, MMW-19A-T01D-GRW, MMW-31A-T01N/D01N-GRW, and MMW-38A-T01N/D01N-GRW the orthophosphate, and dissolved selenium exceeded that of the total analysis of phosphorus, and selenium. Table 1.4 summarizes these results and the data qualifications issued.
Field QC • Field Duplicate (FD) MMW-19A-T01N-GRW MMW-19A-D01N-GRW • Rinsate Blank (RB) • Field Blank (FB) FB05T-GRW • Trip Blank (TB) • Other (e.g., splits)	Yes	The phosphorus field duplicate results were outside evaluation criteria for samples MMW-19A-T01D-GRW and MMW-19A-T01N-GRW. The phosphorus results for these samples were qualified as estimated (J FD-I) The field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	The LCS results for explosives were reviewed as summarized in the case narrative section. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Interference Check Sample (ICS) Results. No sample contained interferent elements at concentration comparable to the ICS. Therefore, no qualification was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)	Fluoride (mg/L)	TDS (mg/L)	TKN (mg/L)	Conductivity (umhos/cm)	pH
MMW-38A-T01N-GRW	0.49 J	0.005 UJ	0.010 UJ	---	10300 J	0.56 J	6290 J	4.5 J
MMW-32A-T01N-GRW	3.3 J	---	---	---	---	0.24 UJ	2180 J	5.0 J
MMW-19A-T01N-GRW	4.4 J	---	---	---	---	0.24 UJ	2220 J	4.6 J
MMW-19A-T01D-GRW	4.4 J	---	---	---	---	0.24 UJ	2190 J	4.6 J
MMW-31A-T01N-GRW	4.1 J	---	---	---	---	0.24 UJ	2200 J	4.4 J
MMW-45A-T01N-GRW	0.62 J	0.005 UJ	0.010 UJ	10.4 J	---	0.24 UJ	1400 J	4.1 J
MMW-45B-T01N-GRW	0.4 UJ	0.005 UJ	0.035 J	57.8 J	---	0.24 UJ	2390 J	4.1 J
P-5C-T01N-GRW	3.5 J	0.005 UJ	0.020 J	---	---	0.24 UJ	1810 J	4.5 J
P-4B-T01N-GRW	3.4 J	0.005 UJ	0.019 J	---	---	0.24 UJ	1730 J	4.6 J
P-5B-T01N-GRW	3.3 J	0.005 UJ	0.012 J	---	---	0.24 UJ	1690 J	4.5 J

Table 1.2
Method Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P) DF=10	0.4		0.8		0.32	0.3	MMW-19A-T01N-GRW, MMW-19A-D01N-GRW, MMW-19A-T01D-GRW, MMW-19A-D01D-GRW, MMW-31A-T01N-GRW, MMW-31A-D01N-GRW, MMW-32A-T01N-GRW, MMW-32A-D01N-GRW, P-4B-T01N-GRW, P-4B-D01N-GRW, P-5B-T01N-GRW, P-5B-D01N-GRW, P-5C-T01N-GRW	U CCB-I
Iron (P) DF=100			37.7	31.4 32.6		31.1	MMW-38A-T01N-GRW, MMW-38A-D01N-GRW	U CCB-I
Lead (MS) DF=10	0.3	0.3	0.4	0.4	-0.411	0.10	MMW-31A-T01N-GRW, MMW-38A-T01N-GRW, MMW-38A-D01N-GRW	U MB-I U CCB-I
Selenium (MS) DF=10				-0.6		0.50	MMW-19A-T01N-GRW, MMW-19A-D01N-GRW, MMW-19A-T01D-GRW, MMW-19A-D01D-GRW, MMW-31A-T01N-GRW, MMW-31A-D01N-GRW, MMW-32A-T01N-GRW, MMW-32A-D01N-GRW, MMW-38A-T01N-GRW, MMW-45A-T01N-GRW, MMW-45A-D01N-GRW, MMW-45B-T01N-GRW, MMW-45B-D01N-GRW, P-4B-T01N-GRW, P-4B-D01N-GRW, P-5B-T01N-GRW, P-5B-D01N-GRW, P-5C-T01N-GRW, P-5C-D01N-GRW	UJ CCB-L J CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution
Results Not Meeting Criteria

Sample/Analyte	% Difference	Action
MMW-38A-T01N-GRW		
Beryllium	29.6%	Qualify parent sample J SD-L
Nickel	14.0%	

Table 1.4
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Sample results	%D	Action
MMW-19A-T01N-GRW • Orthophosphate vs. Phosphorus	0.24/0.10	140%	Results for these analytes in the MMW-19A-T01N-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.
MMW-19A-T01D-GRW • Orthophosphate vs. Phosphorus	0.26/0.06	333%	Results for these analytes in the MMW-19A-T01D-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.
MMW-38A-T01N/D01N-GRW • Selenium	22.7/32.1	41%	Results for these analytes in the MMW-38A-T01N/D01N-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT086A Sampling Event: April 2003

Matrix: Solid __ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 07/21/03

Peer Reviewer: Stacey Coker Date Completed: 07/22/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	pH	Conductivity
MMW-22-T01N-GRW	SA	522827	22-T01N-GRW MMW22T01NGRW	W	X	X	X	X	X	X	X
MMW-22-D01N-GRW	SA	522828		W	X						
MMW-34B-T01N-GRW	SA	522829	34B-T01N-GRW MMW34BT01N-GRW	W	X	X	X	X	X	X	X
MMW-34B-D01N-GRW	SA	522830		W	X						
MMW-10C-T01N-GRW	SA	522831	MMW10CT01NGR	W	X	X			X	X	X
MMW-10C-D01N-GRW	SA	522832		W	X						
MMW-11A-T01N-GRW	SA	522833	MMW11AT01NGR	W	X	X			X	X	X
MMW-11A-D01N-GRW	SA	522834		W	X						
MMW-11A-T01D-GRW	FD	522835	MMW11AT01DGR	W	X	X			X	X	X
MMW-11A-D01D-GRW	FD	522836		W	X						
MMW-11-T01N-GRW	SA	522837	MMW11T01NGRW	W	X	X			X	X	X
MMW-11-D01N-GRW	SA	522838		W	X						
MMW-39A-T01N-GRW	SA	522839		W	X	X				X	X
MMW-39A-D01N-GRW	SA	522840		W	X						
MMW-17A-T01N-GRW	SA	522841		W	X	X				X	X
MMW-17A-D01N-GRW	SA	522842		W	X						
MMW-17B-T01N-GRW	SA	522843		W	X	X				X	X
MMW-17B-D01N-GRW	SA	522844		W	X						
MMW-13-T01N-GRW	SA	522845	MMW13T01NGRW	W	X	X			X	X	X
MMW-13-D01N-GRW	SA	522846		W	X						
MMW-24-T01N-GRW	SA	522847	MMW24T01NGRW	W	X	X			X	X	X
MMW-24-D01N-GRW	SA	522848		W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory noted sample identifiers were abbreviated, in certain instances, to accommodate field length limitations in the data processing.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions were based on the pH categories of the samples, which were determined by the field pH determinations, with the exception of cadmium, cobalt, chromium, copper, potassium, sodium, iron, and nickel for this delivery group. These analytes were reported at a 10-fold dilution instead of 100-fold dilution so that the ion balance calculation would not be controlled by elevated reporting results for nondetect results.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW086A, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified by the laboratory on the quantitation reports. Included in the data package were the extracted ion current profiles.

The laboratory case narrative noted the semivolatile organics analyses of the blank spike samples associated with this delivery group yielded generally acceptable recoveries, with the exception of 4-Nitrophenol and Pentachlorophenol. 4-Nitrophenol was recovered in H1LCS at 77% (with a QC range of 10-80%) and Pentachlorophenol at 95% (with a QC range of 9-103%). Due to the fact that both LCSD recoveries were just above 100%, they were not considered indicative of unacceptable accuracy. It was therefore considered unnecessary to qualify data on the basis of laboratory control standard recoveries for semivolatile organic data

As noted in the laboratory narrative, the nitroaromatics analysis of the blank spike and its duplicate sample (O8LCS/O8LCSD) yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded recoveries of 65%. The laboratory has not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries were less than the lower limit but > 10%, the PYX results for all samples were qualified as estimated (UJ) with a low bias direction.

The nitroaromatic analysis of the blank spike sample U7LCS yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded a recovery of 60%. The laboratory has not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples were qualified as estimated (UJ) with a low bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for all samples were accomplished five to six days beyond the prescribed analytical holding time of 48 hours due to a malfunction of the IC instrument autosampler device. Accordingly, all nitrate results for all samples were qualified as estimated (J/UJ). The laboratory case narrative noted the original TDS analyses of samples MMW-22-T01N-GRW and MMW-39A-T01N-GRW were performed within the prescribed holding time of 7 days. However, after drying the samples, the yielded net weights greatly exceeded the upper limit of the method. The two samples were reanalyzed using smaller sample volumes outside holding time, yielding results comparable to the original analyses. The TDS results (re-analyses) for samples MMW-22-T01N-GRW and MMW-39A-T01N-GRW were qualified as estimated (J). In addition, the majority of nitrite and orthophosphate analyses for samples in this package were run several hours beyond the prescribed holding time of 48 hours and were consequently qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken seven days after sampling and five days beyond log-in. The pH for all samples was measured approximately eight hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). As noted in the laboratory case narrative, sulfate was reanalyzed for sample MMW-17A-T01N-GRW outside the prescribed holding time due to a cation/anion imbalance with the original result. The sulfate result for this sample was therefore qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. 1,2,4-Trichlorobenzene was detected in the volatile blank VBLKQ4 analyzed on 04/14/03. 1,2,4-Trichlorobenzene was reported as nondetect for all volatile samples analyzed in this data package, and consequently no volatile data was qualified on the basis of method blanks. Bis (2-Ethylhexyl)phthalate was detected in the semivolatile blank SBLKH1 analyzed on 04/17/03 at a concentration of 2 µg/L. The two semivolatile samples in this package (MMW-22-T01N-GRW and MMW-34B-T01N-GRW) reported bis (2-Ethylhexyl)phthalate as nondetect and therefore qualification was not considered necessary. An unknown trichloropropene was reported as a tentatively identified compound present in the semivolatile blank SBLKH1. TICs in method blanks are not considered to be reportable as TICs for samples and such identifications as TICs were rejected. No qualification of organic target analytes (volatile or semivolatile) was necessary on the basis of method blank detections.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Method QC • Surrogates • Serial Dilution (A) MMW-22-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample MMW-22-T01N-GRW was not applicable for 21 metal analytes out of 24, as only three of the initial sample results (copper, iron, and manganese) were sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent deviations (%Ds) between the original results and their 5-fold dilutions were compared to an evaluation criterion of ±10% for the applicable metal analytes. The %Ds for copper, iron, and manganese were all less than 10% and as such, did not require qualification. The explosives surrogate, 1,2 dinitrobenzene was recovered above the acceptance range of 85-116% on the confirmation column (118%) for sample MMW-24-T01N-GRW. The recovery of this surrogate on the first column for the same sample was 107%, well within the laboratory's range. No qualification was necessary as the second column serves to verify the presence of the analyte, not quantify the results. The orthophosphate concentration of 0.37 mg/L in sample MMW-10C-T01N-GRWwas greater than the non-detected phosphorus RL of 0.010 mg/L. Due to the fact that both concentrations were not greater than five times the RL (0.010 mg/L), the absolute difference between the two results was compared to an evaluation criterion of ±2x RL (using the higher RL). Accordingly, the orthophosphate and phosphorus results for sample MMW-10C-T01N-GRW were qualified as estimated (J/UJ) with an indeterminate direction of bias. The orthophosphate concentration of 0.14 mg/L in sample MMW-11A-T01D-GRW exceeded the associated total phosphorus concentration of 0.051 mg/L. Due to the fact that both concentrations were greater than 5x the RL (0.010 mg/L), the percent difference between the two values was compared to an evaluation criterion of 30%. The calculated percent difference between these two values was 174%. Accordingly, the orthophosphate and phosphorus results were qualified as estimated (J) with an indeterminate direction of bias. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. The laboratory case narrative noted all samples in this delivery group exhibited ion balance percent differences within the acceptance range, with the exception of sample MMW-17A-T01N-GRW, which exhibited a high percent difference due to a sulfate result that was inconsistent with historical data. Sample MMW-17A-T01N-GRW was re-analyzed for sulfate outside the analytical holding time yielding results that brought the percent difference within acceptance range. No qualification of data in this delivery group was considered necessary on the basis of cation/anion imbalances. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate MMW-11A-T01N/T01D MMW-11A-D01N/D01D • Rinsate Blank • Field Blank • Trip Blank	N/A	With one exception, the field duplicate results were within the QAPP acceptance ranges. The orthophosphate concentration of 0.14 mg/L in sample MMW-11A-T01D-GRW was greater than the orthophosphate concentration of 0.044 mg/L in sample MMW-11A-T01N-GRW. Due to the fact that both concentrations were not greater than five times the RL (0.010 mg/L), the absolute difference between the two results was compared to an evaluation criterion of ±2x RL (using the higher RL). Accordingly, both orthophosphate results were qualified as estimated. The field QC results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial Calibration • VOCs/SVOCs: Continuing Calibration • Metals: Interference Check Sample Results • SVOCs: Initial Calibration Verification Tables 1.3a and 1.3b summarized the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Table 1.4 summarizes qualifications on the basis of initial calibration verification for semivolatile analytes in all SVOC samples.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho P	TDS	Conductivity	pH	SO_4^{2-}
MMW-22-T01N-GRW	0.43 J	0.0064 J	0.010 UJ	4080 J	3280 J	3.5 J	---
MMW-34B-T01N-GRW	3.0 J	0.0050 UJ	0.010 UJ	---	2630 J	4.3 J	---
MMW-10C-T01N-GRW	2.5 J	0.0050 UJ	0.37 J	---	990 J	4.4 J	---
MMW-11A-T01N-GRW	4.4 J	0.0050 UJ	0.044 J	---	2250 J	4.1 J	---
MMW-11A-T01D-GRW	4.3 J	0.0050 UJ	0.14 J	---	2280 J	4.0 J	---
MMW-11-T01N-GRW	4.3 J	0.0050 UJ	0.031 J	---	2330 J	4.0 J	---
MMW-39A-T01N-GRW	21.8 J	0.41 J	0.010 UJ	5470 J	4170 J	4.2 J	---
MMW-17A-T01N-GRW	0.47 J	0.0050 UJ	0.018 J	---	728 J	4.2 J	401 J
MMW-17B-T01N-GRW	0.52 J	0.0050 UJ	0.010 UJ	---	729 J	4.2 J	---
MMW-13-T01N-GRW	2.5 J	---	---	---	1690 J	5.9 J	---
MMW-24-T01N-GRW	64.1 J	---	---	---	2950 J	4.8 J	---

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS)	0.9	0.9	0.9	1.1	0.764	0.30	MMW-17B-T01N-GRW MMW-22-T01N-GRW MMW-24-T01N-GRW	U MB,CCB-I
Arsenic (P)	---	---	---	-5.9	---	4.0	MMW-13-D01N-GRW MMW-13-T01N-GRW MMW-17B-D01N-GRW MMW-17B-T01N-GRW MMW-24-D01N-GRW MMW-24-T01N-GRW	UJ CCB-L
Beryllium (P)	-0.5	-2.9	-1.1	-0.4	-0.374	0.30	All samples with the **exception of:** MMW-34B-D01N-GRW MMW-34B-T01N-GRW MMW-39A-D01N-GRW MMW-39A-T01N-GRW	UJ MB,CCB-L or J CCB-L
Copper (P)	---	2.3	-2.1	-3.2	---	1.5	MMW-13-D01N-GRW MMW-13-T01N-GRW MMW-17A-D01N-GRW MMW-17A-T01N-GRW MMW-17B-D01N-GRW MMW-17B-T01N-GRW	UJ CCB-L or J CCB-L OR U CCB-I
Lead (MS)	---	---	---	---	-2.258	0.10	All samples	UJ MB-L or J MB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% RSD >30%	Action	Qualification and Qualification Codes
VOC	04/07/03 (1234)	2-Hexanone	50.0	Results for this analyte in all samples were qualified as estimated.	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.3b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
SVOC	04/17/03 (0942)	2,4-Dinitrophenol	55.4	All sample results were qualified as estimated	UJ CCAL-I
		4-Nitrophenol	46.3		
		4-Nitroaniline	28.4		
		4,6-Dinitro-2-methylphenol	36.9		
		Pentachlorophenol	37.8		
		3,3'-Dichlorobenzidine	46.0		
		Di-n-octylphthalate	43.8		
		Benzo(b) fluoranthene	25.0		
		Indeno(1,2,3-cd)pyrene	29.6		
		Dibenz(a,h)anthracene	33.2		
VOC	04/14/03 (0946)	2-Hexanone	52.2	All sample results were qualified as estimated	UJ CCAL-I

CCAL = Continuing Calibration %D = Percent Difference

Table 1.4
Initial Calibration Verification Results For Method Spike
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	Analyte	% Recovery	QC Limits	Qualification Codes
SVOC	2,4-Dimethylphenol	64.42	75-125	UJ ICV-L
	3-Nitroaniline	66.06		
	2,4-Dinitrophenol	66.72		
	4-Nitrophenol	71.38		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT088A Sampling Event: April 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 7/10/03

Peer Reviewer: Stacey Coker Date Completed: 7/15/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses		
					Metals	Inorganics	BOD/COD
RR-US-SPRING13-T01N-SFW	SA	522892	RR-US-SPRG13-T01N-SFW or RR-US-SPRIN13-T01N-SF	W	X	X	X
RR-US-SPRING13-D01N-SFW	SA	522893	RR-US-SPRG13-D01N-SFW or RR-US-SPRIN13-D01N-SF	W	X		
RR-DS-SPRING 13-T01N-SFW	SA	522894	RR-DS-SPRG13-T01N-SFW or RR-DS-SPRIN13-T01N-SF	W	X	X	X
RR-DS-SPRING 13-D01N-SFW	SA	522895	RR-DS-SPRG13-D01N-SFW or RR-DS-SPRIN13-D01N-SF	W	X		
SPRING13-T01N-GRW	SA	522896		W	X	X	
SPRING13-D01N-GRW	SA	522897		W	X		

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	A 48-hour holding time was exceeded for nitrate as N, nitrite as N, and orthophosphate by 1-5 days. The analysis for pH and conductivity were exceeded by 2 and 11 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, beryllium, lead, selenium, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Not Applicable	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-US-SPRG13-T01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample RR-US-SPRG13-T01N-SFW, pH class C, was applicable for 0 out of 24 analytes. Recovery for internal standard Y was high for the ICPMS analysis of samples SPRING13-T01N-GRW, and SPRING13-D01N-GRW. Therefore, the molybdenum results for these samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. All alkalinity results for sample RR-US-SPRING13-T01N-SFW were qualified as estimated (J/UJ TvP-I) because the sum of the alkalinity forms was greater than the total alkalinity results.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Not Applicable	This package did not include any site-specific field quality control samples. The field quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Not Applicable	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Orthophosphate (mg/L)	Nitrite (mg/L)	Conductivity (umhos/cm)	pH
RR-US-SPRG13-T01N-SFW	0.54 J	---	---	371 J	7.2 J
RR-DS-SPRG13-T01N-SFW	0.55 J	0.027 J	0.005 UJ	381 J	7.0 J
SPRING13-T01N-GRW	0.4 UJ	---	---	2080 J	4.1 J

Table 1.2
Method Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l	CCB2 (µg/l	CCB3 (µg/l	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P) DF=1			46.6		42.6	RR-DS-SPRG13-D01N-SFW	U CCB-I
Beryllium (P) DF=10		-0.6	-0.4	-0.5	0.3	All samples in this package.	UJ/J CCB, MB-L
Lead (MS) DF=10				0.2	0.1	All samples in this package.	U MB-I
Selenium (MS) DF=10	-0.6	-0.9			0.5	All samples in this package.	UJ/J CCB-L
Zinc (P) DF=100				1.9	1.4	RR-DS-SPRG13-T01N-SFW, RR-DS-SPRG13-D01N-SFW, RR-US-SPRG13-T01N-SFW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT089A Sampling Event: April 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 6/29/03

Peer Reviewer: Stacey Coker Date Completed: 7/15/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides	PCBs
DOUGLASWELL-T01N-GRW	SA	523022	DOUGLASWELLN or DOUGLASWELL-T01N-G	W	X	X			X		
DOUGLASWELL-D01N-GRW	SA	523023	DOUGLASWELL-D01N-G	W	X						
COLUMBINENO1-T01N-GRW	SA	523024	1T01N-GRW, COLUMBINEN01T01N or COLUMBINE or COLUMBINEO1-T01N-G	W	X	X	X	X	X		
COLUMBINENO1-D01N-GRW	SA	523025	COLUMBINEO1-D01N-G	W	X						
COLUMBINENO2-T01N-GRW	SA	523026	2T01N-GRW, COLUMBINEN02T01N or COLUMBINE02 or COLUMBINEO2-T01N-G	W	X	X	X	X	X		
COLUMBINENO2-D01N-GRW	SA	523027	COLUMBINEO2-D01N-G	W	X						
TB210-GRW	TB	523028		W			X				
DOUGLASWELL-T01D-GRW	FD	523029	DOUGLASWELLD or DOUGLASWELL-T01D-G	W	X	X		X			
DOUGLASWELL-D01D-GRW	FD	523030	or DOUGLASWELL-D01D-G	W	X						

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

Although the case narrative noted that the laboratory duplicate results for total phosphorus, total organic carbon, and orthophosphate did not satisfy the laboratory RPD criterion of 20%, the results did satisfy the applicable concentration dependent evaluation criterion the QAPP and data qualification was not necessary.

The metals analyses in this SDG were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of samples, which were determined by the field pH determinations. The exception to this was the reporting of aluminum, cadmium, cobalt, chromium, copper, potassium, iron, manganese, sodium, potassium, zinc, and nickel, which were reported from the 10 times dilution analysis versus the 100 times dilution analysis. This modification was implemented because it was noted that nondetect results at the 100 times dilution were controlling the cation/anion balance calculations and causing it to be outside of limits.

A volatile organic holding blank has been carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and is labeled HB089A.

Manual integration was employed in deriving results for the volatile and semi-volatile organics analyses in this SDG. The values that have been derived from manual integration are qualified on the quantitation reports and extracted ion current profiles are included in the SDG.

The semivolatile organic compounds (SVOC) analysis of laboratory control sample yielded a slightly high percent recovery of the target compounds 4-Nitrophenol (LCSD=104%, control limit = 10-80), and Pentachlorophenol (LCSD=116%, control limit = 9-103). Since the results for these analytes were greater then the control limit and all the samples were nondetect, no qualification necessary.

The nitroaromatics analysis of laboratory control sample yielded a slightly low percent recovery (LCS=65%, LCSD=65%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time; therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	A 48-hour holding time was exceeded by less than 48 hours for nitrate as N and a 28-day holding time for TKN was exceeded by 2 days for all samples except COLUMBINENO2-T01N-GRW, which exceeded the holding time by 8 days due to reanalysis. The analysis for pH and conductivity were exceeded by 2 and 11 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Beryllium, copper, iron, lead, manganese, mercury, zinc, 1,2,4-trichlorobenzene, bis (2-ethylhexyl) phthalate were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD/PDS COLUMBINENO1-T01N-GRW COLUMBINENO1-D01N-GRW • LD COLUMBINENO1-T01N-GRW COLUMBINENO1-D01N-GRW	No	The matrix spike (MS) and matrix spike duplicate (MSD) percent recovery for sulfate, manganese, arsenic, 4-nitrophenol, and PYX was out of limits in sample COLUMBINENO1-T01N-GRW. Table 1.3 summarizes these MS/MSD results. The MS/MSD results for the April 2003 sampling event will be evaluated collectively and any additional data qualification assigned will be summarized in the overall assessment. Parent sample results were qualified on the basis of MS/MSD results per SOP 12.1. The laboratory duplicate (LD) percent recovery for chloride was out of limits in sample COLUMBINENO1-T01N-GRW. Table 1.4 summarizes these LD results. The LD results for the April 2003 sampling event will be evaluated collectively and any additional data qualification assigned will be summarized in the overall assessment. Parent sample results were qualified on the basis of LD results per SOP 12.1.
Method QC • Surrogates • Serial Dilution COLUMBINENO1-T01N-GRW COLUMBINENO1-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis on samples COLUMBINENO1-T01N-GRW and COLUMBINENO1-D01N-GRW, both pH class A, was applicable for 2 out of 24 analytes. For sample COLUMBINENO2-T01N-GRW, the orthophosphate result exceeded that of the total analysis of phosphorus. Table 1.5 summarizes these results and the data qualifications issued.
Field QC • Field Duplicate (FD) DOUGLASWELL-T01D-GRW DOUGLASWELL-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) TB210-GRW • Other (e.g., splits)	Not Applicable	This package included two field duplicate samples and a trip blank quality control sample. The field quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	The LCS results for explosives were reviewed as summarized in the case narrative section. Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		Table 1.6 and 1.7 summarizes initial and continuing calibration detections and the resultant data qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package. • SVOCs: Initial Calibration Verification Table 1.8 summarizes qualifications on the basis of initial calibration verification for semivolatile analytes in all SVOC samples.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	TKN (mg/L)	Conductivity (umhos/cm)	pH
DOUGLASWELL-T01N-GRW	1.7 J	0.24 UJ	1010 J	5.0 J
COLUMBINENO1-T01N-GRW	2.8 J	0.24 UJ	1630 J	5.2 J
COLUMBINENO2-T01N-GRW	2.5 J	0.24 UJ	1320 J	5.1 J
DOUGLASWELL-T01D-GRW	1.7 J	0.25 UJ	1000 J	5.0 J

Table 1.2
Method Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=10	0.3	0.4		0.3	DOUGLASWELL-T01N-GRW, DOUGLASWELL-D01N-GRW, DOUGLASWELL-T01D-GRW, DOUGLASWELL-D01D-GRW	U CCB-I
Iron (P) DF=10			48.41	31.1	COLUMBINENO1-T01N-GRW, COLUMBINENO1-D01N-GRW, DOUGLASWELL-D01N-GRW, DOUGLASWELL-D01D-GRW	U MB-I
Lead (MS) DF=10			-1.144	0.10	All samples in this package.	UJ MB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results Not Meeting Criteria

Sample/Analytes	Matrix Spike/Matrix Spike Duplicate Recovery	Acceptance Limits	Action
COLUMBINENO1-T01N-GRW			
Sulfate	45.2%	75-125%	Qualify parent sample J MS-L
4-nitrophenol	106%	9-103%	Nondetect, no qualification
PYX	15% 17%	70-130%	Qualify parent sample UJ MS-L
COLUMBINENO1-D01N-GRW			
Arsenic	159.3%	75-125%	Nondetect, no qualification

Table 1.4
Laboratory Duplicate Not Meeting Criteria

Sample/Analytes	Sample Results	RPD	Action
COLUMBINENO1-T01N-GRW			
Chloride	16.7 21.6	26%	Qualify parent sample J D-I

Table 1.5
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Absolute Difference	RL	Action
COLUMBINENO2-T01N-GRW • Orthophosphate Vs. Phosphorus	0.024	0.010	Results for these analytes in the COLUMBINENO2-T01N-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.

Table 1.6
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC ICAL Date/Time	Analyte	RSDs >30%	Action	Qualification and Qualification Codes
4/07/03 (1234)	2-Hexanone	50%	Results for this analyte in all samples associated with this calibration event were qualified as estimated.	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.7
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
4/14/03 (0946)	2-Hexanone	52.2%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
4/17/03 (0942)	2,4-Dinitrophenol 4-Nitrophenol Pentachlorophenol 4-Nitroaniline 4,6-dinitro-2-methylphenol 3,3'-Dichlrobenzidine Di-n-octylphthalate Indeno(1,2,3-cd) pyrene Dibenz (a, h) anthracene	55.4% 46.3% 37.8% 28.4% 36.9% 46.3% 43.8% 29.6% 33.2%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I

Table 1.8
Initial Calibration Verification Results For Method Spike
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	Analyte	% Recovery	QC Limits	Qualification Codes
SVOC	2,4-Dimethylphenol	64.42	75-125	UJ ICV-L
	3-Nitroaniline	66.06		
	2,4-Dinitrophenol	66.72		
	4-Nitrophenol	71.38		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT090A Sampling Event: April 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 6/30/03

Peer Reviewer: Alan Roberts Date Completed: 7/7/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses		
					Metals	Inorganics	Explosives
MMW-30A-T01N-GRW	SA	523032	MMW30AT01NGR	W	X	X	X
MMW-30A-D01N-GRW	SA	523033		W	X		
SPRING13PUMP-T01N-GRW	SA	523034	SPRING13PUMP-T01N-G	W	X	X	
SPRING13PUMP-D01N-GRW	SA	523035	SPRING13PUMP-D01N-G	W	X		
MMW-23A-T01N-GRW	SA	523036		W	X	X	
MMW-23A-D01N-GRW	SA	523037		W	X		

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The metals analyses in this SDG were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of samples, which were determined by the field pH determinations. The exception to this was the reporting of cadmium, cobalt, chromium, copper,

potassium, sodium, and nickel, which were reported from the 10 times dilution analysis versus the 100 times dilution analysis. This modification was implemented because it was noted that nondetect results at the 100 times dilution were controlling the cation/anion balance calculations and causing it to be outside of limits.

The nitroaromatics analysis of laboratory control sample yielded a slightly low percent recovery (LCS=65%, LCSD=65%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time; therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The chain of custody from cooler nine was inadvertently sent without the sample collection date entered on the form. The laboratory was contacted and the correction was made so that these samples were logged in with the correct field collection date of 4-10-03.
Holding Times	No	A 48-hour holding time was exceeded for nitrate as N by 2 days and less than 48 hours for nitrite as N, and orthophosphate. A 28-day holding time was exceeded by 2 days for TKN. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Lead, manganese, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Not Applicable	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-30A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis on sample MMW-30A-T01N-GRW, pH class A, was applicable for 1 out of 24 analytes. Recovery for internal standard Y was high for the ICPMS analysis of samples SPRING13PUMP-T01N-GRW, SPRING13PUMP-D01N-GRW, MMW-23A-T01N-GRW, and MMW-23A-D01N-GRW. Therefore, the molybdenum results for these samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Tb was high for the ICPMS analysis of samples MMW-23A-T01N-GRW and MMW-23A-D01N-GRW. Therefore, the antimony results for these samples were reported from the trace ICP. The trace ICP antimony reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Sc was high for the ICPMS analysis of samples MMW-23A-T01N-GRW and MMW-23A-D01N-GRW. Therefore, the aluminum, boron, chromium, and zinc results for these samples were reported from the trace ICP. The trace ICP aluminum, boron, chromium, and zinc reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The related selenium and vanadium results were reported by ICPMS, therefore, were qualified as estimated (J/UJ) based on internal standards. For samples MMW-30A-T01N-GRW, SPRING13PUMP-T01N-GRW, MMW-23A-T01N-GRW the orthophosphate results exceeded those of the total analysis of phosphorus. Table 1.3 summarizes these results and the data qualifications issued.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Not Applicable	This package did not include any site-specific field quality control samples. The field quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the laboratory performance reviews, the following additional parameters were evaluated: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)	TKN (mg/L)
MMW-30A-T01N-GRW	0.98 J	---	0.44 J	0.45 J
SPRING13PUMP-T01N-GRW	0.40 UJ	0.0058 J	0.14 J	0.24 UJ
MMW-23A-T01N-GRW	0.56 J	---	0.22 J	0.45 J

Table 1.2
Method Blank Detections Resulting in Data Qualification

Analyte	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Lead (MS) DF=2	0.4	0.4	0.968	0.10	MMW-23A-T01N-GRW, MMW-23A-D01N-GRW, MMW-30A-D01N-GRW MMW-23A-T01N-GRW, MMW-30A-D01N-GRW	U MB-I U CCB-I
Zinc (P) DF=100			4.974	3.9	MMW-30A-T01N-GRW, MMW-30A-D01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Absolute Difference	RL	Action
MMW-23A-T01N-GRW • Orthophosphate Vs. Phosphorus	0.207	0.01	Results for these analytes in the MMW-23A-T01N-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.
SPRING13PUMP-T01N-GRW • Orthophosphate Vs. Phosphorus	0.13	0.01	Results for these analytes in the SPRING13PUMP-T01N-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.
Sample/Analytes	**Sample Results**	**RPD**	**Action**
MMW-30A-T01N-GRW • Orthophosphate Vs. Phosphorus	0.44/0.08	138%	Results for these analytes in the MMW-30A-T01N-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT091C Sampling Event: April 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 7/2/03

Peer Reviewer: Alan Roberts Date Completed: _____

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
MMW-23B-T01N-GRW	SA	523044		W	X	X
MMW-23B-D01N-GRW	SA	523045		W	X	
CC1B-T01N-GRW	SA	523046		W	X	X
CC1B-D01N-GRW	SA	523047		W	X	
CC2B-T01N-GRW	SA	523048		W	X	X
CC2B-D01N-GRW	SA	523049		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank

FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The chain of custody (COC) for sample MMW-23B-T01N-GRW was not included in the package. The laboratory was contacted and the COC was faxed from the laboratory to be included in the package.
Holding Times	No	A 48-hour holding time was exceeded for nitrate as N, nitrite as N, and orthophosphate by 1-2 days. The analysis for pH and conductivity were exceeded by 2 and 11 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, beryllium, copper, lead, manganese, potassium, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Not Applicable	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-23B-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample MMW-23B-T01N-GRW, pH class C, was applicable for 0 out of 24 analytes. For samples CC1B-T01N-GRW and CC2B-T01N-GRW the orthophosphate exceeded that of the total analysis of phosphorus. Table 1.3 summarizes these results and the data qualifications issued.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Not Applicable	This package did not include any site-specific field quality control samples. The field quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Interference Check Sample (ICS) Results. No sample contained interferent elements at concentration comparable to the ICS. Therefore, no qualification was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Orthophosphate (mg/L)	Nitrite (mg/L)	Conductivity (umhos/cm)	pH
MMW-23B-T01N-GRW	0.4 UJ	---	---	712 J	4.8 J
CC1B-T01N-GRW	0.4 UJ	0.071 J	0.005 UJ	600 J	7.3 J
CC2B-T01N-GRW	0.4 UJ	0.087 J	0.005 UJ	1680 J	7.3 J

Table 1.2
Method Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P) DF=1		0.7				0.3	CC2B-T01N-GRW, CC2B-D01N-GRW	U CCB-I
Copper (P) DF=1		-2.5				2.4	All the samples in this package.	UJ CCB-L
Lead (MS) DF=10			0.4	0.4		0.10	All the samples in this package.	U CCB-I
Manganese (P) DF=10					-1.613	1.3	MMW-23B-D01N-GRW	J MB-L
Potassium (P) DF=1					343.7	327.4	All the samples in this package.	U CCB-I
Zinc (P) DF=10					4.65	3.9	MMW-23B-T01N-GRW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Sample Results with Ddifference >2 RL	RL	Action
CC1B-T01N-GRW • Orthophosphate vs. Phosphorus	0.071 0.010	0.01	Results for these analytes in the CC1B-T01N-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.
CC2B-T01N-GRW • Orthophosphate vs. Phosphorus	0.087 0.010	0.01	Results for these analytes in the CC2B-T01N-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT092A Sampling Event: April 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 7/1/03

Peer Reviewer: Stacey Coker Date Completed: 7/15/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
CAPULINSPRING-T01N-GRW	SA	523040	CAPULINSPRG-T01N-GRW or CAPULINSPRG-T01N-GR	W	X	X
CAPULINSPRING-D01N-GRW	SA	523041	CAPULINSPRG-D01N-GRW or CAPULINSPRG-D01N-GR	W	X	
GOATHILLSPRING-T01N-GRW	SA	523042	GOATHILLSPG-T01N-GRW or GOATHILLSPG-T01N-GR	W	X	X
GOATHILLSPRING-D01N-GRW	SA	523043	GOATHILLSPG-D01N-GRW or GOATHILLSPG-D01N-GR	W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The metals analyses in this SDG were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of samples, which were determined by the field pH determinations. The exception to this was the reporting of cyanide which was reported from the 10 times dilution analysis versus the 100 times dilution analysis. This modification was implemented because it was noted that nondetect results at the 100 times dilution were controlling the cation/anion balance calculations and causing it to be outside of limits.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	A 48-hour holding time was exceeded for nitrate as N by 6 days and less than 48 hours for orthophosphate. A 7-day holding time was exceeded by 7 days for TDS due to necessary re-analyses. The analysis for pH and conductivity were exceeded by 2 and 11 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Beryllium, cadmium, copper, iron, lead, manganese, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Not Applicable	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution CAPULINSPRG-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	Recovery for internal standard Li was high for the ICPMS analysis of samples CAPULINSPRG-T01N-GRW, CAPULINSPRG-D01N-GRW, GOATHILLSPR-T01N-GRW, and GOATHILLSPG-D01N-GRW. Therefore, the potassium results for these samples were reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Tb was high for the ICPMS analysis of samples CAPULINSPRG-T01N-GRW, CAPULINSPRG-D01N-GRW, GOATHILLSPR-T01N-GRW, and GOATHILLSPG-D01N-GRW. Therefore, the antimony, barium, and cadmium results for these samples were reported from the trace ICP. The trace ICP antimony, barium, and cadmium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Sc was high for the ICPMS analysis of samples CAPULINSPRG-T01N-GRW, CAPULINSPRG-D01N-GRW, GOATHILLSPR-T01N-GRW, and GOATHILLSPG-D01N-GRW. Therefore, the aluminum, boron, chromium, selenium, and zinc results for these samples were reported from the trace ICP. The trace ICP aluminum, boron, chromium, selenium, and zinc reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The related vanadium results were reported by ICPMS, therefore, were qualified as estimated (J/UJ) based on internal standards. Recovery for internal standard Y was high for the ICPMS analysis of samples CAPULINSPRG-T01N-GRW, CAPULINSPRG-D01N-GRW, GOATHILLSPR-T01N-GRW, and GOATHILLSPG-D01N-GRW. Therefore, the molybdenum results for these samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution analyses were conducted on sample CAPULINSPRG-T01N-GRW, pH class A. The percent difference between the original result and result for the diluted sample for beryllium and iron did not satisfy the ≤10% criterion and the results were qualified as estimated. Table 1.3 summarizes these results. The serial dilution results for each sampling event will be evaluated collectively and any resultant/additional data qualification will be summarized in the overall assessment. Parent samples were qualified on the basis of serial dilution results per SOP 12.1. For samples CAPULINSPRG-T01N-GRW and GOATHILLSPG-T01N-GRW the orthophosphate exceeded that of the total analysis of phosphorus. Table 1.4 summarizes these results and the data qualifications issued.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Not Applicable	This package did not include any site-specific field quality control samples. The field quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the laboratory performance reviews, the following additional parameters were evaluated: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Conductivity (umhos/cm)	pH
CAPULINSPRG-T01N-GRW	2.0 UJ	12.3 J	21300 J	8890 J	3.6 J
GOATHILLSPG-T01N-GRW	2.0 UJ	11.5 J	21200 J	9370 J	3.1 J

Table 1.2
Method Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Codes
Cadmium (P) DF=100		-0.8						0.7	CAPULINSPRG-D01N-GRW, GOATHILLSPG-D01N-GRW	J CCB-L
Lead (MS) DF=10				0.4	0.4	0.4	0.968	0.10	CAPULINSPRG-T01N-GRW, CAPULINSPRG-D01N-GRW, GOATHILLSPG-D01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Results Not Meeting Criteria

Sample/Analyte	%Difference	Action
CAPULINSPRG-T01N-GRW		
Iron	16.5%	Qualify parent sample J SD-L
Beryllium	40.8%	

Table 1.4
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Sample results %D Greater than 30%	RL	Action
CAPULINSPRG-T01N-GRW • Orthophosphate Vs. Phosphorus	0.246 0.019	0.01	Results for these analytes in the CAPULINSPRG-T01N-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.
GOATHILLSPG-T01N-GRW • Orthophosphate Vs. Phosphorus	0.23 0.018	0.01	Results for these analytes in the GOATHILLSPG-T01N-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT093A

Sampling Event: April 2003 Surface Water

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 07/24/03

Peer Reviewer: Stacey Coker

Date Completed: 07/28/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses				
				Metals	Inorganics	BOD	pH	Conductivity
CAPULIN1-T01N-SFW	SA	523038	W	X	X	X	X	X
CAPULIN1-D01N-SFW	SA	523039	W	X				

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations. The laboratory noted that cadmium, cobalt, chromium, copper, potassium, iron, sodium, magnesium, and nickel were reported from a 10x dilution instead of the 100x dilution as specified by the dilution scheme so that ion balance calculations would not be controlled by nondetect results with elevated reporting limits. No qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory log-in sheet emphasized samples CAPULIN1-T/D01N-SFW were sampled on 04/10/03 as opposed to 04/11/03, as indicated on the COC. A fax from the client (URS) verified the sampling date of 04/10/03 as correct and that a mistake had been made on the COC. In addition, the COC erroneously listed samples CAPULIN1-T/D01N-SFW as 'GRW". The client (URS) in the same facsimile to the laboratory dated 04/11/03 verified this correction. No qualification of data was necessary as these issues did not adversely affect the quality of the data.
Holding Times	No	The laboratory case narrative noted the nitrate analysis for sample CAPULIN1-T01N-SFW was accomplished one day beyond the prescribed analytical holding time of 48 hours due to a malfunction of the IC instrument autosampler device. In actuality, the nitrate analysis was two days beyond the holding time specification. Accordingly, the nitrate result for sample CAPULIN1-T01N-SFW was qualified as estimated (UJ) with an indeterminate direction of bias. In addition, the TKN analysis of sample CAPULIN1-T01N-SFW was completed two days beyond the prescribed holding time of 28 days. According to the case narrative and the internal chain of custody, the TKN sample was digested within the holding time. The TKN result was qualified as estimated (UJ) with an indeterminate direction of bias. The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. The conductivity measurement for sample CAPULIN1-T01N-SFW was taken 11 days after sampling and nine days beyond log-in. The pH for the same sample was measured approximately six hours beyond log-in. Therefore, the conductivity and pH results for this sample were qualified as estimated (J), with an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) CAPULIN1-T01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample CAPULIN1-T01N-SFW was not applicable for 23 of the 24 metal analytes, as the initial sample results for only one analyte (manganese) was sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent difference (%D) between the initial sample result and the serial dilution result (5x) was compared to an evaluation criteria of ±10% for manganese. The reported %D (9.7%) was less than 10%. It was therefore not necessary to qualify any results on the basis of serial dilution. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. The reported cation/anion balance for sample CAPULIN1-T/D01N-SFW met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No field QC samples were analyzed with this package. The field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Lead (MS)	0.3	0.3	0.4	0.4	0.968	0.10	CAPULIN1-T01N-SFW	U CCB-I
Selenium (MS)	---	---	---	-0.6	---	0.50	CAPULIN1-T01N-SFW	J CCB-L
Zinc (P)	---	---	---	---	4.974	3.9	CAPULIN1-D01N-SFW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

For the sake of brevity, the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT099C Sampling Event: April 2003

Matrix: Solid __ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter Date Completed: 07/24/03

Peer Reviewer: Stacey Coker Date Completed: 07/24/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Inorganics	Metals	VOCs	SVOCs	PCBS
MolyTunnel-T01N-GRW	SA	524685	MOLYTT01NGW MT-T01N-GRW T01N-GRW	W	X	X	X	X	X
MolyTunnel-D01N-GRW	SA	524686		W	X				
TB209-GRW	TB	524687		W			X		

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW099C, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified by the laboratory on the quantitation reports. Included in the data package were the extracted ion current profiles.

The target compound 4-Nitrophenol was recovered in the semivolatile laboratory control sample (84%) and its duplicate (85%) at recoveries marginally above the acceptance limits established by the laboratory of 10-80%. The semivolatile blank spike results indicated a greater level of accuracy than typically attained. Although these recoveries were outside the acceptance range, they are not considered to be indicative of unacceptable accuracy. As such, the 4-Nitrophenol results were considered acceptable without qualification.

The case narrative provided by the laboratory noted the metals analysis of the continuing calibration check standards associated with the samples in this package yielded percent recoveries for silver that slightly exceeded the control criteria. Silver was not detected in either sample and therefore data qualification was not considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample MolyTunnel-T01N-GRW was not marked for pH or conductivity measurements on the COC, however were assigned for these analyses upon log-in.
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. The conductivity measurement for sample MolyTunnel-T01N-GRW was taken 15 days after sampling and 14 days beyond log-in. The pH for the same sample was measured approximately nine hours beyond log-in. Therefore, the conductivity and pH results for this sample were qualified as estimated (J), with an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Only chromium detections in CCB2 (-1.1 µg/L) and CCB3 (-1.1 µg/L) resulted in the qualification of data. The chromium results for both samples MolyTunnel-T01N-GRW and MolyTunnel-D01N-GRW were qualified as estimated (UJ), with an indeterminate direction of bias. 1,2,-Dibromo-3-chloropropane and 1,2,4-Trichlorobenzene were detected in VBLKW6 (one of the two volatile blank samples) analyzed on 04/29/03 at 4 µg/L and 3 µg/L, respectively. Both analytes were reported as nondetect in the associated samples. 2-Pentanone, 4-Hydroxy-4-Methyl, O-Hydroxybiphenyl, and an unknown trichloropropene were reported as tentatively identified compounds present in the semivolatile blank SBLKL5. TICs in method blanks are not considered to be reportable as TICs for samples and such identifications as TICs were rejected. No qualification of organic target analytes (volatile or semivolatile) was necessary on the basis of method blank detections.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC Surrogates Serial Dilution (C) MolyTunnel-T01N-GRW Total vs. Partial Analyses Cation/Anion Balance	No	The serial dilution analysis on sample MolyTunnel-T01N-GRW was not applicable for 21 of the 24 metal analytes, as the initial sample results for only three analytes were sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent differences (%Ds) between the initial sample results and the serial dilution results (5x) were compared to an evaluation criteria of ±10% for the three analytes. All reported %Ds were less than 10%. It was therefore not necessary to qualify any results on the basis of serial dilution. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. The laboratory case narrative noted all samples in this delivery group exhibited ion balance percent differences within the acceptance range. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank TB209-GRW	N/A	The results for TB209-GRW were all nondetect. The field QC results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	NA	
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	No	Tables 1.1a and 1.1b summarize the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues.
Laboratory Control Sample Results	No	Refer to case narrative summary.
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Detected organic analytes with concentrations between the MDL and RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL.

Table 1.1a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	ICAL Date/Time	Analyte	% RSD >30%	Samples Qualified	Qualification and Qualification Codes
VOC	04/07/03 (1234)	2-Hexanone	50.0	MolyTunnel-T01N-GRW TB209-GRW	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.1b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	|%D| >25%	Samples	Qualification and Qualification Codes
VOC	04/29/03 (2130)	1,1,2-Trichloro-1,2,2-triflu	-34.5	MolyTunnel-T01N-GRW TB209-GRW	UJ CCAL-I
		Acetone	-41.3		
		2-Butanone	-43.0		
		Chloroform	-26.0		
		1,2-Dichloroethane	-27.2		
		1,2-Dibromo-3-chloropropane	27.5		
VOC	05/01/03 (0630)	2-Hexanone	58.2	None of the samples were associated with this event.	---
SVOC	05/05/03 (0507)	Benzaldehyde	46.0	MolyTunnel-T01N-GRW	UJ CCAL-I
		2,4-Dinitrotoluene	-35.8		
		4-Nitroaniline	29.3		
		4,6-Dinitro-2-methylphenol	-26.9		

CCAL = Continuing Calibration %D = Percent

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT103A Sampling Event: June 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 7/15/03

Peer Reviewer: Stacey Coker Date Completed: 7/17/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
STORM1-T01N-SFW	SA	255062		W	X	X
STORM1-D01N-SFW	SA	525063		W	X	
SPRING39-T01N-GRW	SA	525064		W	X	X
SPRING39-D01N-GRW	SA	525065		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank

FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issue potentially affecting data quality was noted in the case narrative.

The ICP/MS analyses of the continuing calibration verification solution associated with the samples in this SDG yielded percent recoveries for silver that slightly exceeded the upper limit of the control range 90-110%, with recoveries of 114%, 113%, and 112%. However, all of the silver sample results were nondetect; therefore no qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	A 48-hour holding time was exceeded for nitrate as N by 2 days and less than 48 hours for nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 1-2 and 15-16 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, chromium, and iron were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	No	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the June 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution STORM`-T01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis on sample STORM1-T01N-SFW, pH class A, was applicable for 2 out of 24 analytes.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Not Applicable	This package did not include any site-specific field quality control samples. The field quality control results for the June 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the laboratory performance reviews, the following additional parameters were evaluated: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
STORM1-T01N-SFW	5.3 J	0.011 J	0.010 UJ	798 J	7.5 J
SPRING39-T01N-GRW	---	---	---	1160 J	6.3 J

Table 1.2
Method Blank Detections Resulting in Data Qualification

Analyte	CCB3 (µg/l)	CCB4 (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) STORM1 DF=1 SPRING39 DF=10	87.4	104.2	50.3	SPRING39-T01N-GRW, SPRING39-D01N-GRW	U CCB-I
Chromium (P) STORM1 DF=1 SPRING39 DF=10	-1.1	-1.1	1.0	All samples in this SDG.	UJ CCB-L
Iron (P) STORM1 DF=1 SPRING39 DF=10	46.9	46.9	31.1	STORM1-D01N-SFW	UJ CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit.

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WATRAS4 Sampling Event: April and July 2003 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 1/16/04

Peer Reviewer: Stacey Coker Date Completed: 1/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses
					Aluminum, Arsenic, Cadmium
OUTFALL 002-D01N-GRW4	SA	556811		W	X
OUTFALL 002 WELL-D01N-GRW	SA	556812		W	X
OUTFALL 002 PIPE-D01N-GRW	SA	556813		W	X
OUTFALL 002-D01N-GRW7	SA	556814		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD=Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

The analytical results presented in the enclosed submittal represent re-analyese performed for OUTFALL samples collected in April and July. These samples were re-analyzed for aluminum, arsenic, and cadmium with no dilutions to achieve the lowest possible reporting limit.

A “4” suffix was added to sample OUTFALL 002-D01N-GRW to designate the sample collected in April collection date and “7” was added to the same sample Id to designate the sample collected in July.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 180-day holding time for aluminum, arsenic, and cadmium was exceeded by less than 95 days. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April and July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the individual events.
Method QC • Surrogates • Serial Dilution OUTFALL 002-D01N-GRW4 • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on sample OUTFALL 002-D01N-GRW4, pH class C, were applicable for 0 out of 3 analytes. The serial dilution results for the April and July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the individual events. Parent sample results were qualified on the basis of serial dilution results.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any site-specific field quality control samples. The field quality control results for the April and July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the individual events..
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Aluminum (µg/l)	Arsenic (µg/l)	Cadmium (µg/l)
OUTFALL002-D01N-GRW4	32.9 UJ	0.48 J	0.2 UJ
OUTFALL002WELL-D01N-GRW	32.9 UJ	0.49 J	0.31 J
OUTFALL002PIPE-D01N-GRW	32.9 UJ	0.42 J	0.54 J
OUTFALL002-D01N-GRW7	32.9 UJ	0.45 J	0.2 UJ

--- = Samples were within hold time; therefore no qualification was necessary.

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE MAY 2003 MONTHLY GROUNDWATER AND SURFACE WATER

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Holding Blanks 3-1
3.2.2 Manual Integration 3-1
3.2.3 Low-Level Detections 3-1
3.2.4 TICS Reported In Blanks 3-1
3.2.5 Dilution Schemes/Non-Detects With Elevated RLs 3-2
3.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 3-2
3.2.7 Non-Valid Matrix Spikes 3-2
3.2.8 Laboratory Performance Review (LPR) Findings 3-3

Section 4 Collective Assessment of Matrix Quality Control Results 4-1

4.1 Organic Matrix Spike Results (Accuracy/Precision Evaluation) 4-2
4.2 Inorganic Matrix Spike Results (Accuracy Evaluation 4-2
4.2.1 Post-Digestion Spikes 4-5
4.3 Inorganic Laboratory Duplicate Results (Precision Evaluation) 4-5
4.4 ICP Serial Dilution Results 4-6

Section 5 Collective Assessment of Field Quality Control Results 5-1

5.1 Field Duplicate Agreement 5-1
5.2 Rinsate Blank Results 5-2
5.3 Field Blank Results 5-4
5.4 Trip Blank Results 5-4

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-2
6.3 Completeness 6-2
6.4 Representativeness 6-3
6.5 Comparability 6-3
6.6 Sensitivity 6-3

TABLE OF CONTENTS

List of Tables

Table 1-1 Summary of Groundwater Samples Collected May 2003
Table 1-2 Summary of Surface Water Samples Collected May 2003
Table 4-1 Field Samples Designated for Matrix QC Analysis
Table 4-2 Frequency Requirements for Matrix QC
Table 4-3 Organics Matrix Spike Results
Table 4-4 Inorganics Matrix Spike Results
Table 4-5 Metals Matrix Spike Results
Table 4-6 Inorganic Laboratory Duplicate Results
Table 4-7 ICP Serial Dilution Results
Table 4-8 ICP Serial Dilution Overall Assessment
Table 5-1 Summary of Field Duplicate Samples Collected May 2003
Table 5-2 Field Duplicate Collection Frequency for the May 2003 Sampling Event
Table 5-3 Summary of Rinsate Blank Samples Collected May 2003
Table 5-4 Summary of Rinsate Blank Results and Additional Qualifications
Table 5-5 Summary of Field Blank Samples Collected May 2003
Table 5-6 Summary of Field Blank Results and Additional Qualifications
Table 6-1 Summary of Precision Assessment for May 2003
Table 6-2 Summary of Accuracy Assessment for May 2003

List of Attachments

Attachment 1.1 Data Review Summary for Data Package WAT104C
Attachment 1.2 Data Review Summary for Data Package WAT105A
Attachment 1.3 Data Review Summary for Data Package WAT106A
Attachment 1.4 Data Review Summary for Data Package WAT107C
Attachment 1.5 Data Review Summary for Data Package WAT108C
Attachment 1.6 Data Review Summary for Data Package WAT109A
Attachment 1.7 Data Review Summary for Data Package WAT110C
Attachment 1.8 Data Review Summary for Data Package WAT111C
Attachment 1.9 Data Review Summary for Data Package WAT112A

This Data Validation Report (DVR) provides a general overview of the usability of the surface and groundwater chemical analytical data obtained during the May 2003 sampling event at Molycorp Questa Mine in Questa, New Mexico. This report contains the results and process of the sample specific data reviews and collective evaluations for the water samples collected in support of the Remedial Investigation/Feasibility Study (RI/FS) during the month of May 2003.

May 2003 RI/FS water samples were submitted to Severn Trent Laboratories (STL) Burlington in Colchester, Vermont for chemical analysis. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods utilized were according to the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). Sample and QC results were reported in nine original packages.

Tables 1-1 and 1-2 summarize the groundwater and surface water samples collected during this sampling event, along with the analyses performed on each sample and the accompanying QC samples.

Table 1-1
Summary of Groundwater Samples Collected May 2003

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
CC-1A-T01N-GRW (WAT110C)	X	X	X	---	---	---
CC-1B-T01N-GRW (WAT108C)	X	X	X	---	---	---
CC-2A-T01N-GRW (WAT108C)	X	X	X	---	---	---
CC-2B-T01N-GRW (WAT108C)	X	X	X	---	---	---
CHAMBERS SPRING-T01N-GRW (WAT111C)	X	X	X	---	---	---
COLUMBINECG WELL#1-T01N-GRW (WAT111C)	X	X	X	---	---	---
EMBARGO ROAD SEEP-T01N-GRW (WAT111C)	X	X	X	---	---	---
GWW-1-T01N-GRW (WAT106A)	X	X	X	---	---	---
GWW-2-T01N-GRW (WAT105A)	X, MS, LD	X, MS, LD	X, MS, LD	---	---	---
GWW-3-T01N-GRW (WAT106A)	X	X	X	---	---	---
MMW-10A-T01N-GRW (WAT105A)	X	X	X	---	---	---
MMW-17A-T01N-GRW (WAT109A)	X	X	X	---	---	---
MMW-17B-T01N-GRW (WAT105A)	X, RB	X, RB	X, RB	---	---	---
MMW-27A-T01N-GRW (WAT109A)	X	X	X	---	---	X
MMW-28A-T01N-GRW (WAT106A)	X	X	X	X	X	X
MMW-29A-T01N-GRW (WAT106A)	X	X	X	---	---	X
MMW-31B-T01N-GRW (WAT104C)	X	X	X	---	---	X
MMW-33A-T01N-GRW (WAT105A)	X	X	X	---	---	X
MMW-42B-T01N-GRW (WAT104C)	X	X	X	---	---	---
MMW-44A-T01N-GRW (WAT105A)	X	X	X	X, FB	X, FB	X, FB
MMW-44B-T01N-GRW (WAT104C)	X, RB	X, RB	X, RB	X, RB	X, RB	X, RB
MMW-45A-T01N-GRW (WAT106A)	X, FD	X, FD	X,FD	---	---	---
MMW-45B-T01N-GRW (WAT105A)	X	X	X	---	---	---
MMW-47A-T01N-GRW (WAT105A)	X, MS, LD	X, MS, LD	X, MS, LD	X, MS, MSD	X, MS, MSD	X, MS, MSD
MMW-48A-T01N-GRW (WAT109A)	X, FD	X, FD	X, FD	X, FD	X, FD	X, FD
MMW-49A-T01N-GRW (WAT106A)	X	X	X	---	---	---
MW-17-T01N-GRW (WAT108C)	X, RB	X, RB	X, RB	X, RB	X, RB	X, RB
MW-1-T01N-GRW (WAT104C)	X, MS, LD	X, MS, LD	X, MS, LD	---	---	---
MW-20-T01N-GRW (WAT104C)	X, FD	X, FD	X, FD	---	---	---
MW-21-T01N-GRW (WAT110C)	X	X	X	---	---	---
MW-23-T01N-GRW (WAT108C)	X	X	X	---	---	---

Table 1-1
Summary of Groundwater Samples Collected May 2003

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
MW-24-T01N-GRW (WAT104C)	X	X	X	---	---	---
MW-9A-T01N-GRW (WAT104C)	X, RB	X, RB	X, RB	---	---	---
SPRING13-T01N-GRW (WAT106A)	X	X	X	---	---	---
SPRING13PUMP-T01N-GRW (WAT105A)	X	X	X	---	---	---
SPRING15M-T01N-GRW (WAT112A)	X	X	X	---	---	---
SPRING39-T01N-GRW (WAT106A)	X	X	X	---	---	---
SPRING39PUMP-T01N-GRW (WAT105A)	X	X	X	---	---	---
TPZ-1-T01N-GRW (WAT108C)	X	X	X	---	---	---
TPZ-2-T01N-GRW (WAT110C)	X	X	X	---	---	---
TPZ-5B-T01N-GRW (WAT111C)	X	X	X	---	---	---
TPZ-5U-T01N-GRW (WAT111C)	X	X	X	---	---	---
TPZ-6U-T01N-GRW (WAT110C)	X	X	X	---	---	---
TPZ-7L-T01N-GRW (WAT111C)	X	X	X	---	---	---
Number GW samples	44	44	44	6	6	10
Number MS/MSD or MS/LD	3	3	3	1	1	1
Number Field Duplicates	3	3	3	1	1	1
Number Rinsate Blanks	3	3	3	2	2	2
Number Field Blanks	NA	NA	NA	1	1	1

NA = Not Applicable MS = Matrix Spike LD = Laboratory Duplicate MSD = Matrix Spike Duplicate
RB = Rinsate Blank FB = Field Blank FD = Field Duplicate
[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

Table 1-2
Summary of Surface Water Samples Collected May 2003

Sample Identification	Total Metals	Dissolved Metals	Inorganics	BOD/COD
RR-DS-SPRING13-T01N-SFW (WAT107C)	X, RB	X, RB	X, RB	X, RB
RR-DS-SPRING39-T01N-SFW (WAT107C)	X	X	X	X
RR-US-SPRING13-T01N-SFW (WAT107C)	X, MS, LD	X, MS, LD	X, MS, LD	X, MS, LD
RR-US-SPRING39-T01N-SFW (WAT107C)	X, FD	X, FD	X, FD	X, FD
Number SFW samples	4	4	4	4
Number MS/MSD or MS/LD	1	1	1	1
Number Field Duplicates	1	1	1	1
Number Rinsate Blanks	1	1	1	1

MS = Matrix Spike LD = Laboratory Duplicate FD = Field Duplicate
[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

The data review process evaluated sample-specific and laboratory performance criteria in accordance with the standard operating procedure (SOP) 12.1. As mentioned in the SOP, all RI/FS data generated for the Questa Mine received an evaluation of sample-specific parameters. In addition, 10% of the data packages (per analysis type per event/episode) were reviewed for laboratory performance parameters. The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Sample-specific reviews evaluated the following sample related parameters:

- Case narrative comments
- Chain-of-Custody/Sample Receipt
- Holding Times
- Method Blank (Preparation Blank)
- Matrix-Dependent Quality Control
  - Matrix Spike Analysis
  - Laboratory duplicate Analysis
- Method-Specific Quality Control Measures
  - Inorganic Method Specific QC Measures
    - Post Digestion Spike Analysis
    - ICP Serial Dilution Tests
    - Internal Standard Performance
    - Cation/Anion Balance Evaluation
  - Organic Method Specific QC Measures
    - Surrogate Spike Compound Recovery
    - Internal Standards
- Total versus Partial Balance
- Field quality control samples
  - Field Duplicate Agreement
  - Rinsate Blank Results
  - Field Blank Results
  - Trip Blank Results

Evaluation of laboratory performance parameters provided an overall representation of the analytical system at the time the samples were analyzed. The laboratory performance review evaluated parameters in control of the laboratory, but independent of the field samples analyzed, as follows:

- Initial Calibration
- Continuing Calibration Verification
- Laboratory Control Sample Analysis

- Compound Identification
- Target Analyte Quantification
- Verification
- Method Specific Quality Control Checks

If any potential systematic problems were determined upon review of the laboratory performance parameters in any of the selected packages evaluated (meeting the 10% criteria), the review parameter was evaluated in all data packages for May 2003 to determine the need for data qualification. Instances, in which professional judgment was exercised in evaluating the need for data qualification, the basis for this rationale was provided in the data review summary.

Upon completion of the sample-specific reviews and laboratory performance reviews, a collective assessment for the event was performed. Site-specific matrix spike, laboratory duplicate, serial dilution, blank (field and rinsate), and field duplicate results were assessed collectively by matrix per event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered more representative of the site sample matrix and a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 3.0 describes sample specific data review findings and several data quality issues affecting all of the water packages. Section 4.0 presents the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Section 5.0 summarizes the collective summary of the field QC results (field and rinsate blanks, when applicable, and field duplicate results) and the resultant sample qualification. Lastly, an overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for data packages WAT104 through WAT112, for a total of nine original data packages. In order to attain the frequency requirements for laboratory performance reviews, one data package (WAT104CA) was evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were identified which globally affected all relevant groundwater and surface water samples analyzed for the May 2003 Monthly Groundwater and Surface Water sampling event**.** Although most of the issues have been addressed in the individual summary reports, these common issues and conclusions are summarized below.

3.2.1 Holding Blanks

For the analysis of the volatile organic samples, a holding blank was carried through the sample storage period and analyzed in the same sequence as the samples in the data package. As all holding blank recoveries were all nondetect, the indication of the occurrence of potential cross-contamination during sample storage was unlikely.

3.2.2 Manual Integration

Manual integration was employed in deriving results for the volatile and semivolatile organics in a few data packages. The values that were derived from manual integration were qualified on the quantitation reports and extracted ion current profiles were included for each instance. The supporting documentation provided was reviewed and found to be adequate.

3.2.3 Low-level Detections

Detected organic analytes with concentrations between the Method Detection Limit (MDL) and the Reporting Limit (RL) were qualified as estimated (J). A qualifier code of “SQL-I” (Sample Quantitation Limit) was assigned to reflect the greater uncertainty in quantitative values below the RL.

3.2.4 TICS Reported in Blanks

Several Tentatively Identified Compounds (TICs) were reported as present in the semivolatile blanks for each package. The unknown compounds detected in the method blank were qualified as (NJ) to denote the analyses indicated the presence of an analyte that had been “tentatively identified” and the associated numerical value represented its approximate value. However, if similar TICs were present in the associated samples, the results were not considered to be reportable due to laboratory contamination (as indicated by the blank) and therefore, flagged as

unusable (R). After evaluating sample TICs based on laboratory method blanks, any remaining TICs were qualified as "NJ."

3.2.5 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

3.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilbria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

3.2.7 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.8 Laboratory Performance Review (LPR) Findings

As mentioned previously, one data package was given a full validation to assess the performance of the laboratory for all analyses. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated for all packages for this event included:

- Initial Calibration Verification (ICV) for all SVOC.

Inorganic parameter matrix QC consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. Organic parameter QC consisted of matrix spike/matrix spike duplicate (MS/MSD) analyses. The site-specific matrix QC results were assessed collectively for the May 2003 Groundwater and Surface Water Sampling Event by matrix (groundwater and surface water, total versus dissolved fractions) to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.5 present the collective matrix QC results associated with the samples in this event and the resultant data qualifiers.

Three groundwater field samples were designated for both total/dissolved metals, and inorganics matrix spike analyses. One groundwater field sample was designated for volatile, semivolatile, and explosives organics matrix spike analyses. One surface water field sample was designated for total/dissolved, and inorganic matrix spike analyses, as summarized in Table 4-1. Table 4-2 summarizes the breakdown of frequency requirements for each of the analyses per groundwater and surface water for the May 2003 Groundwater and Surface Water Sampling Event.

Table 4-1
Field Samples Designated for Matrix QC Analysis

Sample ID	Analyses					
	Total Metals	Dissolved Metals	Inorganics	VOCs	SVOCs	Explosives
GROUNDWATER						
MW-20-T01N-GRW (WAT104C)	X	X	X	---	---	---
MMW-45A-T01N-GRW (WAT106A)	X	X	X	---	---	---
MMW-48A-T01N-GRW (WAT109A)	X	X	X	X	X	X
SURFACE WATER						
RR-US-SPRING39-T01N (WAT107C)	X	X	X	NA	NA	NA

Table 4-2
Frequency Requirements for Matrix QC

Analyses	# of Matrix QC Samples	Total # Samples	Percentage (%)
GROUNDWATER			
Total Metals	3	44	6.8
Dissolved Metals	3	44	6.8
Inorganics	3	44	6.8
VOC[1]	1	6	16
SVOC[1]	1	6	16
Explosives[1]	1	10	10
SURFACE WATER			
Total Metals	1	4	25
Dissolved Metals	1	4	25
Inorganics	1	4	25
BOD	1	4	25

[1]Frequency percent for organic analyses (VOC, SVOC, and Explosives are based on MS/MSD pairs.

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

4.1 ORGANIC MATRIX SPIKE RESULTS (ACCURACY/PRECISION EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy and precision of the analytical results.

All matrix spike recoveries and RPD values for organics analyses (VOCs, SVOCs, Explosives, and Pesticides/PCBs) were within the historical acceptance range, or otherwise considered an acceptable recovery when historical limits were not available (i.e., between 75-125%), with the exception of PYX. Table 4-3 summarizes the average matrix recoveries for the organic target analytes, along with the laboratory's historical limits and additional action, when warranted.

Table 4-3
Organics Matrix Spike Results

Analyte	Fraction	Historical Laboratory Recovery	Average % Recovery	Action
1,1-Dichloroethene	VOC	61-145	117	None
Benzene	VOC	76-127	105	None
Trichloroethene	VOC	71-120	116	None
Toluene	VOC	76-125	105	None
Chlorobenzene	VOC	75-130	104	None
Phenol	VOC	12-110	76	None
2-Chlorophenol	SVOC	27-123	81	None
N-Nitroso-di-n-propylamine	SVOC	41-116	86	None
4-Chloro-3-methylphenol	SVOC	23-97	86	None
Acenaphthene	SVOC	46-118	85	None
2,4-Dinitrotoluene	SVOC	24-96	77	None
4-Nitrophenol	SVOC	10-80	83	None
Pentachlorophenol	SVOC	9-103	74	None
Pyrene	SVOC	26-127	83	None
HMX	Explosives	83-122	99	None
RDX	Explosives	81-116	91	None
2,4,6-Trinitrotoluene	Explosives	75-106	91	None
PETN	Explosives	75-110	82	None
PYX	Explosives	70-130	7	All results non-detect R MS-L

With the exception of PYX results, no qualification was necessary for any organic result on the basis of matrix spike recovery. MS/MSD recoveries for PYX were both below 10%. Since PYX was not detected in any of the samples collected for the May 2003 event, all PYX results were qualified as not usable (R).

4.2 INORGANIC MATRIX SPIKE RESULTS (ACCURACY EVALUATION

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results.

A number of MS recoveries were outside of the acceptance limits of 75-125% for both inorganics and metals. Tables 4-4 and 4-5 summarize the inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

In general, qualification was limited to the parent sample if fewer than a quarter of the applicable matrix spike recoveries were outside the acceptance range. Conversely, if more than a quarter of the applicable matrix spike recoveries were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average matrix spike recovery, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

Table 4-4
Inorganics Matrix Spike Results

Analyte	Number of Valid Spikes/ Total Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
INORGANICS GROUNDWATER					
Chloride	3/3	0	0	98.9	None
Nitrate	3/3	0	1	110.3	None (parent result was non-detect)
Fluoride	3/3	0	0	97.4	None
Ammonia	3/3	0	0	84.2	None
TKN	3/3	0	0	88.3	None
Nitrite	3/3	0	0	99.1	None
Ortho-phosphate	3/3	0	1	113.5	J MS-H to parent only when applicable
Phosphorus	3/3	0	0	99.3	None
Sulfate	3/3	0	0	80.1	None
TOC	3/3	0	0	100.0	None
Cyanide	3/3	2	0	42.1	J/UM MS-L for all cyanide results
INORGANICS SURFACE WATER					
Chloride	1/1	0	0	100.1	None
Nitrate	1/1	0	0	103.9	None
Fluoride	1/1	0	0	103.5	None
Ammonia	1/1	0	0	79.4	None
TKN	1/1	0	0	94.5	None
Nitrite	1/1	0	0	94.5	None
Ortho-phosphate	1/1	0	0	90.1	None
Phosphorus	1/1	0	0	116.0	None
Sulfate	1/1	1	0	74.0	J/UJ MS-L parent
TOC	1/1	0	0	120.0	None
BOD_5	1/1	0	0	101.5	None
COD	1/1	0	0	123.0	None
Cyanide	1/1	0	0	88.6	None

Table 4-5
Metals Matrix Spike Results

Analyte	Total				Dissolved				Action
	# Valid	%R <75%	%R > 25%	Avg %R	# Valid	%R <75%	%R > 125%	Avg %R	
METALS GROUNDWATER									
Aluminum	1	0	0	103.9	1	0	0	109.9	None
Antimony	3	0	0	107.7	3	0	0	104.2	None
Arsenic	3	0	0	109.5	3	0	0	108.1	None
Barium	3	0	0	105.4	3	0	0	102.1	None
Beryllium	3	0	0	105.7	3	0	0	103.1	None
Boron	3	0	0	112.4	3	0	0	109.5	None
Cadmium	3	0	0	106.2	3	0	0	101.5	None
Chromium	3	0	0	106.0	3	0	0	102.8	None
Cobalt	3	0	0	106.4	3	0	0	102.6	None
Copper	3	0	0	109.7	3	0	0	104.7	None
Iron	3	0	0	92.0	3	0	0	113.3	None
Lead	3	0	0	101.3	3	0	0	105.5	None
Manganese	1	0	0	107.0	1	0	0	108.8	None
Mercury	3	0	0	100.1	3	0	0	102.3	None
Molybdenum	3	0	0	105.6	3	0	0	102.0	None
Selenium	3	0	0	100.7	3	0	0	108.4	None
Nickel	3	0	0	105.1	3	0	0	101.4	None
Thallium	3	0	0	104.5	3	0	0	107.1	None
Silver	3	0	0	99.7	3	0	0	103.77	None
Vanadium	3	0	0	102.0	3	0	0	104.8	None
Zinc	1	0	0	107.1	1	0	0	108.0	None
METALS SURFACE WATER									
Aluminum	1	0	0	100.6	1	0	0	96.5	None
Antimony	1	0	0	88.9	1	0	0	92.9	None
Arsenic	1	0	0	88.0	1	0	0	86.6	None
Barium	1	0	0	97.7	1	0	0	97.6	None
Beryllium	1	0	0	100.6	1	0	0	99.7	None
Boron	1	0	0	100.9	1	0	0	100.9	None
Cadmium	1	0	0	89.2	1	0	0	88.4	None
Chromium	1	0	0	101.0	1	0	0	99.8	None
Cobalt	1	0	0	100.7	1	0	0	99.8	None
Copper	1	0	0	103.5	1	0	0	104.3	None
Iron	1	0	0	104.6	1	0	0	98.7	None
Lead	1	0	0	104.8	1	0	0	101.1	None
Manganese	1	0	0	100.8	1	0	0	99.0	None
Mercury	1	0	0	111.0	1	0	0	103.0	None
Molybdenum	1	0	0	101.2	1	0	0	98.9	None
Selenium	1	0	0	86.0	1	0	0	80.7	None
Nickel	1	0	0	99.2	1	0	0	98.6	None
Thallium	1	0	0	101.7	1	0	0	100.6	None
Silver	1	0	0	98.1	1	0	0	97.5	None
Vanadium	1	0	0	98.9	1	0	0	97.0	None
Zinc	1	0	0	97.2	1	0	0	94.5	None

Qualifications which resulted are in bold type

Cyanide was the only analyte for groundwater for which data qualification was necessary for all event samples. Two of the three cyanide matrix spike recoveries were below 30%. As specified in SOP 12.1, this would initiate the action of rejecting nondetect cyanide results. However, these were class A samples (i.e., initial pH < 5.6), with a pH of 4.5 which appears to inhibit the presence of cyanide. Therefore, using professional judgment, the parent sample results and all other cyanide results for May 2003 were qualified as estimated J/UJ with a low bias assigned. Nitrate and ortho-phosphate MS recoveries were the only other inorganic exceedances for groundwater. The nitrate recovery of 126.7% was only marginally above the upper limit. In the case of orthophosphate, the phosphorus matrix spike recoveries, as well as comparisons between total and partial analyses, were acceptable. It was therefore concluded that this was an isolated issue with the orthophosphate spike. Additionally, both nitrate and orthophosphate average recoveries fell within the acceptance range of 75-125%. Due to the limited frequency and magnitude of the exceedances, data qualification on the basis of MS recoveries was limited to parent samples. Furthermore, both exceedances indicated a high bias and only nitrate was detected and thus qualified.

Table 4-4 above also indicates that the accuracy of the analyses relative to the site-specific surface water matrix was acceptable as all average recoveries were within limits, with the exception of sulfate. The MS recovery for sulfate was 74.0%, marginally below the lower limit of the acceptance range. One result was not sufficient to establish a matrix analytical problem. As such, it was not considered necessary to qualify sulfate globally.

As indicated in the table, the accuracy of the analyses relative to the site-specific matrix was acceptable, as all matrix spike recoveries for all metal analytes, with the exception of cyanide, as discussed above, reported acceptable recoveries.

4.2.1 Post-Digestion Spikes

Post-digestion spikes were conducted on all ICP and ICP/MS analytes to determine whether matrix recoveries outside of the acceptance range were the result of sample matrix, or due to a bias in the analytical system. All post digestion recoveries for those analytes recovered outside of the acceptance range were reviewed and recovered within the range of 75-125%. Therefore, no qualification of data was assigned for any of the metal analytes on the basis of post-digestion spike recovery, as it was likely that all matrix spike exceedances were due to a matrix effect on digestion rather than a bias in the analytical system.

4.3 INORGANIC LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Laboratory duplicate sample results were evaluated to assess the precision of the laboratory analyses. Three groundwater samples and one surface water sample were designated for metals, dissolved metals, and inorganic parameters laboratory duplicate analysis. The evaluation criteria used are summarized in SOP 12.1. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

The RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within the QAPP acceptance limits for

all laboratory duplicate analyses, with the exception of one TSS result. The parent sample was accordingly qualified as estimated (J), with an indeterminate direction assigned, as summarized in Table 4-6. It was not necessary to assign any global qualifications on the basis of laboratory duplicate results.

Table 4-6
Inorganic Laboratory Duplicate Results

Analyte	#Duplicate Results Exceeding Criteria	Action
INORGANICS		
TSS	1	Parent sample qualified J D-L

Based on the LD results, the overall level of precision demonstrated is considered to be acceptable.

4.4 ICP SERIAL DILUTION RESULTS

ICP serial dilutions were performed on metal samples in every data package. These analyses were run on the same samples as were designated for matrix QC analyses, or otherwise randomly selected in data packages in which there were no QC samples designated. These analyses were used to evaluate whether or not significant physical or chemical interferences existed due to sample matrix. This was accomplished by analyzing the sample and a five-fold dilution of the sample. The percent difference (%D) between these two concentrations was compared for those analytes for which the serial dilution analysis was applicable (i.e., the initial concentrations were sufficiently higher (50x) than the IDL, accounting for dilution).

Table 4-7 summarizes each sample utilized for a serial dilution analysis, along with the associated applicable analytes, and the results exceeding the acceptance criterion of ≤10%D.

Table 4-7
ICP Serial Dilution Results

Sample ID	Applicable Analytes (%D>10% in bold)
GROUNDWATER – DISSOLVED FRACTION	
MW-1-D01N-GRW (WAT104C)	Sb, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Pb, Mn, Mo, Se, Ni, Tl, Ag, V, Zn
GWW-2-D01N-GRW (WAT105A)	Cu (10.4)*
MMW-47A-D01N-GRW (WAT105A)	---
GROUNDWATER – TOTAL FRACTION	
MW-1-T01N-GRW (WAT04C)	Sb, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Pb, Mn, Mo, Ni, Tl, Ag, V, Zn
GWW-2-T01N-GRW (WAT105A)	**Cu (12.5)**
MMW-47A-T01N-GRW (WAT105A)	---
GWW-1-T01N-GRW (WAT106A)	Al, Ca, Mn, Zn
MW-17-T01N-GRW (WAT108C)	Mo
MMW-48A-T01N-GRW (WAT109A)	Al, Ca, Pb, Mn, Zn
MW-21-T01N-GRW (WAT110C)	---
COLCGWELL#1-T01N-GRW (WAT111C)	Pb
SPRING15M-T01N-GRW (WAT112A)	Al, Mn, Zn

Table 4-7
ICP Serial Dilution Results

Sample ID	Applicable Analytes (%D>10% in bold)
SURFACE WATER DISSOLVED FRACTION	
RR-US-SPRING13-D01N-SFW (WAT107C)	Al, Ba, Be, B, Ca, Cr, Co, Cu, Fe, Mn, Mo, Ni, Zn
SURFACE WATER-TOTAL FRACTION	
RR-US-SPRING13-T01N-SFW (WAT107C)	Al, Ba, Be, B, Ca, Cr, Co, Cu, Fe, Mn, Mo, Ni, Zn

---Indicates the serial dilution was not applicable to any of the metal analytes.

*As 10.4% rounded to 10, it was not considered in excess of the control criteria.

Table 4-8 summarizes the average % Ds for each of the analytes, broken down into total and dissolved fractions, along with the percent of applicable analytes that exceeded control criteria (10%) for both groundwater and surface water samples, and the resultant qualifiers based on the collective assessment. Where exceedances were identified, the diluted result is generally considered more accurate as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result. Qualifications were generally limited to the parent samples if less than a quarter of the valid serial dilution results were outside of the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set and the magnitude of outages were also taken into consideration. For this event, evaluation of the serial dilution results collectively did not result in any additional qualification of results. The analysis was considered to be in control and did not indicate a pervasive matrix analytical problem.

Table 4-8
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	Avg. %D	%Ds >10%	# of Valid Results	% Valid Result >10%	Avg. %D	%Ds >10%	# of Valid Results	% Valid Result >10%	
GROUNDWATER									
Aluminum	3.3	0	3	0%	---	---	0	---	None
Antimony	7.5	0	1	0%	8.5	0	1	0%	None
Arsenic	---	---	0	---	---	---	0	---	None
Barium	0.8	0	1	0%	0.8	0	1	0%	None
Beryllium	1.9	0	1	0%	0.7	0	1	0%	None
Boron	1.0	0	1	0%	3.6	0	1	0%	None
Cadmium	3.1	0	1	0%	5.9	0	1	0%	None
Calcium	4.5	0	3	0%	5.0	0	1	0%	None
Chromium	2.1	0	1	0%	3.7	0	1	0%	None
Cobalt	3.1	0	1	0%	4.5	0	1	0%	None
Copper	6.7	1	2	50%	6.4	0	1	0%	**Parent only J/UJ DL-H (total)**
Iron	4.8	0	1	0%	---	---	0	---	None
Lead	2.8	0	2	0%	1.6	0	1	0%	None
Magnesium	---	---	0	---	---	0	0	0%	None
Manganese	3.0	0	4	0%	4.6	0	1	0%	None

Table 4-8
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	Avg. %D	%Ds >10%	# of Valid Results	% Valid Result >10%	Avg. %D	%Ds >10%	# of Valid Results	% Valid Result >10%	
Molybdenum	1.3	0	2	0%	3.5	0	1	0%	None
Nickel	3.8	0	1	0%	4.9	0	1	0%	None
Potassium	---	---	0	---	---	---	0	---	None
Selenium	---	---	0	---	4.5	0	1	0%	None
Silver	4.3	0	1	0%	5.8	0	1	0%	None
Sodium	---	---	0	---	---	---	0	---	None
Thallium	1.7	0	1	0%	0.8	0	1	0%	None
Vanadium	5.6	0	1	0%	5.7	0	1	0%	None
Zinc	3.6	0	4	0%	0.7	0	1	0%	None
SURFACE WATER									
Aluminum	3.2	0	1		5.3	0	1		None
Antimony	---	---	0	---	---	---	0	---	None
Arsenic	---	---	0	---	---	---	0	---	None
Barium	0.9	0	1	0%	2.0	0	1	0%	None
Beryllium	2.9	0	1	0%	3.7	0	1	0%	None
Boron	3.8	0	1	0%	4.2	0	1	0%	None
Cadmium	---	---	0	---	---	---	0	---	None
Calcium	1.5	0	1	0%	3.4	0	1	0%	None
Chromium	1.3	0	1	0%	2.5	0	1	0%	None
Cobalt	1.0	0	1	0%	2.2	0	1	0%	None
Copper	2.5	0	1	0%	2.3	0	1	0%	None
Iron	1.8	0	1	0%	3.2	0	1	0%	None
Lead	---	---	0	---	---	---	0	---	None
Magnesium	---	---	0	---	---	---	0	---	None
Manganese	1.1	0	1	0%	2.4	0	1	0%	None
Molybdenum	1.7	0	1	0%	3.4	0	1	0%	None
Nickel	0.6	0	1	0%	1.5	0	1	0%	None
Potassium	---	---	0	---	---	---	0	---	None
Selenium	---	---	0	---	---	---	0	---	None
Silver	---	---	0	---	---	---	0	---	None
Sodium	---	---	0	---	---	---	0	---	None
Thallium	---	---	0	---	---	---	0	---	None
Vanadium	---	---	0	---	---	---	0	---	None
Zinc	4.5	0	1	0%	5.0	0	1	0%	None

As is evident from the table above, only one serial dilution result was in excess of 10%. Accordingly, the parent sample for this analyte (copper) was qualified as estimated (J), with a high bias assigned, as the initial concentration was greater than the diluted concentration. It was not considered necessary to issue data qualification globally because the average %D was below 10% and one result out of two applicable results was not sufficient to establish a matrix analytical problem, nor a bias direction related to dilution for the remainder of copper results. There was no indication of a matrix analytical problem related to serial dilutions for metal analyses.

Site-specific field duplicate samples, rinsate blanks, and field blanks were assessed collectively by matrix for the May 2003 Groundwater and Surface Water Sampling Event to determine the need for qualification of sample results of similar matrices. The sections to follow summarize the results for these QC samples and any collective qualifications arising from the assessments.

5.1 FIELD DUPLICATE AGREEMENT

The field duplicate agreement assessment evaluated the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, as follows. When both concentration results were sufficiently greater (5x) the RL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤30%. If one or both of the concentration results were less than 5x the RL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤2x the RL. Again, the frequency of the field duplicate samples followed the frequency of matrix spike and laboratory duplicate analyses, as the same samples were designated for all QC parameters. Table 5-1 summarizes the sample sites, which were duplicated and notated as field duplicate samples, per parameter. The breakdown of field duplicate pair samples per analysis and fraction can be referenced in Table 5-2.

Table 5-1
Summary of Field Duplicate Samples Collected May 2003

Sample ID	Analyses						
	Total Metals	Dissolved Metals	Inorganics	VOCs	SVOCs	Explosives	BOD
MW-20-T01N/T01D-GRW (WAT104C)	X	X	X	---	---	---	NA
MW-20-D01N/D01D/GRW (WAT104C)	X	X	X	---	---	---	NA
MMW-45A-T01N/T01D-GRW (WAT106A)	X	X	X	---	---	---	NA
MMW-45A-D01N/D01D-GRW (WAT106A)	X	X	X	---	---	---	NA
MMW-48A-T01N/T01D-GRW (WAT109A)	X	X	X	X	X	X	NA
MMW-48A-D01N/D01D-GRW (WAT109A)	X	X	X	X	X	X	NA
RR-US-SPRING39-T01N/T01D-SFW (WAT107C)	X	X	X	---	---	---	X
RR-US-SPRING39-D01N/D01D-SFW (WAT107C)	X	X	X	---	---	---	X

Table 5-2
Field Duplicate Collection Frequency for the May 2003 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	3	44	6.8
Dissolved Metals	3	44	6.8
Inorganics	3	44	6.8
VOC	1	6	16.7
SVOC	1	6	16.7
Explosives	1	10	10.0
SURFACE WATER			
Total Metals	1	4	25.0
Dissolved Metals	1	4	25.0
BOD/COD	1	4	25.0

All field duplicate samples assessed for the May 2003 Groundwater and Surface Water Sampling event were within the criteria specified in SOP 12.1. As such, it was not necessary to qualify any results in this event for field duplicate imbalances. Based on the FD results, the overall level of precision demonstrated is considered to be acceptable.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blank samples were prepared by pouring ASTM type II water/laboratory supplied "reagent-free" water over decontaminated sampling equipment and collecting the water in the appropriate sampling containers. Table 5-3 summarizes the rinsate blank samples associated with the samples collected during the May Groundwater and Surface water sampling event. The QAPP required frequency of 5% for the collection of rinsate blanks was met for the May 2003 sampling event.

Table 5-3
Summary of Rinsate Blank Samples Collected May 2003

Sample ID	Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives	BOD/COD
GROUNDWATER – TOTAL FRACTION						
RB01T-GRW (WAT104C)	X	X	X	X	X	X
RB02T-GRW (WAT104C)	X	X	---	---	---	---
RB03T-GRW (WAT105A)	X	X	---	---	---	---
Frequency:	6.8%	6.8%	16.7%	16.7%	10.0%	6.8%
GROUNDWATER – DISSOLVED FRACTION						
RB01D-GRW (WAT104C)	X	X	X	X	X	X
Frequency:	2.3%	2.3%	16.7%	16.7%	10.0%	2.3%
SURFACE WATER –TOTAL FRACTION						
RB01T-SFW (WAT107C)	X	X	NA	NA	NA	X
Frequency:	25%	25%	---	---	---	25%

Table 5-4 summarizes the analytes detected in the associated RI/FS rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 5-4
Summary of Rinsate Blank Results and Additional Qualifications

Analytes	RL	# of Detections	Total # of Rinsate Blanks	% Detections	Average Conc. (mg/L)	x5 Criteria (mg/L)	Range for Field Samples (mg/L)	Action
GROUNDWATER- TOTAL FRACTION								
Acetone	10	1	1	33	2	10	1-10 (ug/L)	Detected acetone results ≤10.0→ U RB-I
Ammonia	0.04	3	3	100	0.12	0.62	0.04-0.45	Detected ammonia results ≤0.62→ U RB-I
Bicarbonate Alkalinity	1.0	3	3	100	3.13	15.7	1-470	Detected bicarbonate results ≤15.7→ U RB-I
Total Alkalinity	1.0	3	3	100	3.13	15.7	1-470	Detected total alk. Results ≤15.7→ U RB-I
Cadmium	0.5	1	3	33	0.34	1.70	0.4-57.4 (ug/L)	Detected cadmium results ≤1.70→ U RB-I
Chloride	0.4	3	3	100	3.14	15.7	0.63-89.7	Detected chloride results ≤15.70→ U RB-I
Copper	1.5	1	3	33	1.06	5.3	1.5-6250 (ug/L)	Detected copper results ≤5.33→ U RB-I
Phosphorus	0.01	2	3	67	0.0083	0.04	0.01-0.64	Detected phosphorus results ≤0.04 U RB-I
TDS	10	3	3	100	20	100	80-4590	Detected TDS results ≤→100.UB-I
TSS	0.5	1	3	33	0.43	2.17	0.5-370	Detected TSS results ≤2.17 U RB-I
Zinc	14	1	3	33	11.2	56.0	14-10800 (ug/L)	Detected zinc results ≤56.0 U RB-I
SURFACE WATER- TOTAL FRACTION								
Ammonia	0.04	1	1	100	0.043	0.22	0.055-0.091	Detected ammonia results ≤0.22 RB-I
Bicarbonate Alkalinity	1.0	1	1	100	2.8	14.0	50.6-54.2	Detected bicarbonate results ≤14.0 RB-I
Total Alkalinity	1.0	1	1	100	2.8	14.0	50.6-54.2	Detected total alk results ≤14.0 RB-I
Chromium	1.0	1	1	100	1.4	7.0	1.1-2.1 (ug/L)	Detected chromium results ≤7.0 RB-I
Iron	31.1	1	1	100	36.9	184.5	603-797 (ug/L)	None
Manganese	1.0	1	1	100	1.7	8.5	96.2-170 (ug/L)	None
Phosphorus	0.01	1	1	100	0.013	0.07	0.13-0.37	Detected phosphorus results ≤0.07 RB-I
TDS	10	1	1	100	16.0	80.0	130-198	None5
Zinc	1.4	1	1	100	2.7	13.5	59.2-75 (ug/L)	5

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results less than the calculated criteria concentration. In determining the average concentrations, one half the RL was used for nondetect values to represent the contributing concentration, as opposed to zero, which could potentially bias the average concentration low. Despite the fact that some results were qualified as nondetect on the basis of rinsate blank detections, the rinsate blank results are generally indicative of acceptable decontamination procedures as detections were infrequent and at low levels.

5.3 FIELD BLANK RESULTS

The analyses of organic parameters require field blanks to assure appropriate quality control. The field blank results are utilized to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Table 5-5 summarizes the field blank samples that were collected with the organic samples in this data package. The required QC frequency of 5% was attained. Bis(2-ethylhexyl)phthalate was the only analyte detected in any of the field blank samples. Table 5-6 summarizes the samples in which this parameter was reported, as well as the average concentration, and criteria number calculated in the assessment of qualification as nondetect of this analyte in organic sample results.

Table 5-5
Summary of Field Blank Samples Collected May 2003

Sample ID	Volatile Organics	Semivolatile Organics	Explosives
GROUNDWATER –TOTAL FRACTION			
FB01T-GRW (WAT105A)	X	X	X
Frequency:	25%	25%	25%

Table 5-6
Summary of Field Blank Results and Additional Qualifications

Field Blank ID	Compound	Avg. Conc. (µg/L)	x5 Criteria (µg/L)	Range for Field Samples (µg/L)	Action
FB01T-GRW	Bis (2-ethylhexyl) phthalate	2.0	5.0	2.0	No qualification was necessary

Qualification was not necessary as there were no bis(2-ethylhexyl)phthalate detections in field samples. The field blank results indicate that no contamination of field samples were due to ambient field conditions.

5.4 TRIP BLANK RESULTS

A trip blank accompanied each cooler of VOC samples to the sampling site. It was handled like an environmental sample and returned to the laboratory for VOC analysis. Trip blank results were used to assess the potential introduction of contaminants from sample containers or during the transportation/storage procedures. All trip blank samples associated with the volatile organic samples in the May 2003 sampling event were nondetect, with the exception of TB218-GRW, which reported a recovery of acetone at 4.0 ug/L. Acetone was not detected in any of the VOC samples associated with this trip blank and contamination from the previously mentioned sources was unlikely. No qualification was necessary.

With the exception of the ten PYX results, all data were considered acceptable for use in meeting project objectives as qualified. Multiple sample results were qualified as nondetect on the basis of contamination identified in the laboratory blank or rinsate blank. Others were qualified as estimated on the basis of matrix spike, LCS, or surrogate recoveries. Lastly, several data results were qualified as estimated on the basis of holding time exceedances, serial dilution results, laboratory/field duplicate disagreements, total vs. partial disagreements, anion/cation imbalances, or calibration results (for organics). These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment for May 2003

Analysis Type	QC Measure	# of Analytes Measured	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	FD	33	33	100
	LD	33	32	96.9
Total metals	FD	66	66	100
	LD	66	66	100
Dissolved Metals	FD	63	63	100
	LD	63	63	100
Volatile Organics	FD	43	43	100
	MSD	5	5	100
Semivolatile Organics	FD	62	62	100
	MSD	6	6	100
Explosives	FD	5	5	100
	MSD	5	4	80
SURFACE WATER				
Inorganics	FD	11	11	100
	LD	11	11	100
Total Metal	FD	22	22	100
	LD	22	22	100
Dissolved Metals	FD	21	21	100
	LD	21	21	100
BOD_5/COD	FD	1	1	100
	LD	1	1	100

The percentage of acceptable precision measurements was 100% for all parameters, with the exception of explosives for groundwater, for which 80% of the matrix spike duplicate analyses were within acceptable limits. The overall level of precision demonstrated for all analyses collectively was considered to be acceptable.

6.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Percent of MS (and MSD) recoveries meeting criteria are summarized in Table 6-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters. The only analyte, which was systematically reviewed and accordingly qualified on the basis of low LCS recoveries, was PYX. Of the data packages comprising the May 2003 Groundwater and Surface Water Sampling Event, 59.3% of the PYX results were qualified as estimated (J/UJ) with a low bias direction.

Table 6-2
Summary of Accuracy Assessment for May 2003

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	MS	33	30	90.9
Metals	MS	123	121	98.4
Volatile Organics	MS/MSD	10	5	100
Semivolatile Organics	MS/MSD	18	18	100
Explosives	MS/MSD	10	8	80.0
SURFACE WATER				
Inorganics	MS	11	10	90.9
Metals	MS	41	41	100

The percentage of acceptable accuracy measurements ranged from 80-100%. No qualifications were issued collectively for any analytes in surface water samples. Cyanide and PYX were globally qualified for groundwater samples. The overall level of accuracy with respect to the site matrix demonstrated for all analyses collectively was considered to be acceptable.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results were considered usable as qualified for meeting project objectives, with the exception of the ten PYX results, which were rejected on the basis of extremely low matrix spike recoveries. As such, a percentage of 98.3% was calculated to represent the completeness of ground water samples and 100% for surface water samples, both of which satisfied the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the groundwater and surface water samples collected during the May 2003 sampling event. The close agreement between the field duplicate results, as discussed in Section 5.1, indicated that the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 5.2 indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analytes. Where possible, the laboratory submitted data from lesser dilutions (for organic analyses), thereby achieving detection limits for non-detects, as specified in the QAPP. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. While it is anticipated that all non-rejected data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT104C Sampling Event: May 2003 GRW/SFW

Matrix: Solid _____ Water X Biota _____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 08/20/03

Peer Reviewer: Stacey Coker Date Completed: 08/22/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses					
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides
MW-20-T01N-GRW	SA	525989		W	X	X				
MW-20-D01N-GRW	SA	525990		W	X					
MW-20-T01D-GRW	FD	525991		W	X	X				
MW-20-D01D-GRW	FD	525992		W	X					
MW-24-T01N-GRW	SA	525993		W	X	X				
MW-24-D01N-GRW	SA	525994		W	X					
MMW-42B-T01N-GRW	SA	525995		W	X	X				
MMW-42B-D01N-GRW	SA	525996		W	X					
MMW-31B-T01N-GRW	SA	525997	MMW31BT01NGR	W	X	X			X	
MMW-31B-D01N-GRW	SA	525998		W	X					
MW-1-T01N-GRW	SA	525999		W	X	X				
MW-1-D01N-GRW	SA	526000		W	X					
MW-9A-T01N-GRW	SA	526001		W	X	X				
MW-9A-D01N-GRW	SA	526002		W	X					
MMW-44B-T01N-GRW	SA	526003	MMW44BT01NGR MMW44BT1NGRW	W	X	X	X	X	X	
MMW-44B-D01N-GRW	SA	526004		W	X					
RB01T-GRW	RB	526005		W	X	X	X	X	X	
RB01D-GRW	RB	526006		W	X					
RB02T-GRW	RB	526007		W	X	X				
TB208-GRW	TB	526008		W			X			

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality, were noted in the case narrative.

The metal analyses of the samples in this SDG were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations. The exception to this was the reporting of lead from the Trace ICP analysis for select samples due to results that were over range on the ICP/MS.

The nitroaromatics analysis of laboratory control sample yielded a slightly lower percent recovery (LCS=60%) of the target compound PYX. The laboratory has not yet established control limits for this compound, therefore they used the default criteria of 70-130%. Since the LCS recovery is less than the lower limit but >10%, the associated sample results have been qualified as estimated ("UJ"/"J").

Review Parameter	**Criteria Met?**	**Comments**
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory noted a lack of adequate preservative in sample MMW-42B-T01N-GRW, MMW-31B-T01N-GRW, and MMW-44B-T01N-GRW. The laboratory added additional NaOH to these samples to adjust the pH.
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 5 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, cadmium, copper, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS MW-1-T01N-GRW MW-1-D01N-GRW • LD MW-1-T01N-GRW MW-1-D01N-GRW	No	The laboratory duplicate relative percent difference for TSS was out of limits in sample MW-1-T01N-GRW. Table 1.3 summarizes these LD results. The matrix quality control results for the May 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MW-1-T01N-GRW MW-1-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution test for samples MW-1-T01N-SFW and MW-1-D01N-GRW was applicable for 16 of the 24 metals. The serial dilution results for the May 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. For sample RB01T/D-GRW, the anion/cation (A/C) balance was 27.8%, outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary for AC balance.
Field QC • Field Duplicate (FD) MW-20-T01D-GRW MW-20-D01D-GRW • Rinsate Blank (RB) RB01T-GRW RB01D-GRW RB02T-GRW • Field Blank (FB) • Trip Blank (TB) TB208-GRW • Other (e.g., splits)	No	While all field duplicate results were within acceptance limits, there were a few detections in the various field quality control blanks (RB). These are summarized in Table 1.4. The FD, RB, FB results for the May 2002 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration The initial calibration events for VOCs and SVOCs satisfied all response and linearity criteria; therefore no qualification was necessary. Table 1.5 summarizes continuing calibration results for which the drift evaluation criterion was not met and the resultant data qualifications. SVOC results for 3-nitroaniline (70.8) and carbazole (74.1) were qualified in all samples as estimated with the qualifier code: "ICV-L". • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
MW-20-T01N-GRW	1.9 J	0.005 UJ	0.023 J	417 J	7.0 J
MW-20-T01D-GRW	1.9 J	0.005 UJ	0.023 J	416 J	7.0 J
MW-24-T01N-GRW	---	0.005 UJ	---	350 J	7.0 J
MMW-42B-T01N-GRW	---	0.005 UJ	---	2790 J	6.8 J
MMW-31B-T01N-GRW	---	0.005 UJ	0.01 UJ	2910 J	6.7 J
MW-1-T01N-GRW	0.55 J	0.005 UJ	0.01 UJ	1700 J	7.1 J
MW-9A-T01N-GRW	0.52 J	0.005 UJ	0.012 J	1260 J	7.2 J
MMW-44B-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	2630 J	7.0 J
RB01T-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1.3 J	7.0 J
RB02T-GRW	0.20 UJ	0.005 UJ	0.01 UJ	0.00 J	5.4 J

=Samples were analyzed within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P) DF=10	60.3					50.3	MW-20-T01N-GRW, MW-20-T01D-GRW, MW-24-T01N-GRW	U CCB-I
Antimony (MS) DF=2		0.3	0.4	0.3		0.30	MMW-44B-T01N-GRW, MMW-44B-D01N-GRW	U CCB-I
Cadmium (P) DF=1			0.7				RB01T-GRW	U CCB-I
Copper (P) DF=1			2.3			1.5	RB01T-GRW	U CCB-I
Zinc (P) DF=10					4.2	1.4	MW-20-T01N-GRW, MW-20-T01D-GRW, MW-24-T01N-GRW, MMW-42B-D01N-GRW, MW-1-T01N-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, RB02T-GRW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank MB=Method Blank IDL=Instrument Detection Limit
RL= Reporting Limit
Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Laboratory Duplicate Not Meeting Criteria

Sample/Analytes	Laboratory Duplicate RPD	Acceptance Limits	Action
MW-1-T01N/D01N-GRW			
Total Suspended Solids	52	<20%	Qualify parent sample J D-L

Table 1.4
Positive Results for Rinsate Blanks

Analyte	RB01T-GRW	RB02T-GRW	RL
Total Dissolved Solids (mg/L)	24	22	10.0
Total Suspended Solids (mg/L)	0.80	---	0.5
Chloride (mg/L)	4.5	4.5	0.4
Bicarbonate Alkalinity (mg/L)	4.2	2.5	1.0
Total Alkalinity (mg/L)	4.2	2.5	1.0
Ammonia (mg/L)	0.14	0.15	0.04
Phosphourus (mg/L)	0.01	0.01	0.01

Table 1.5
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
5/7/03 (1008)	Carbon disulfide 1,2-Dibromo-3-chloropropane	26.7% 33.3%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
5/14/03 (0712)	4-Chloro-3-methylphenol 4-Nitrophenol Indeno (1,2,3-cd) pyrene Dibenz (a,h) anthracene Benzo (g,h,i) perylene	-31.4% -56.5% 26.3% 27.8% 29.5%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT105A Sampling Event: May 2003 GRW/SFW

Matrix: Solid ___Water _X_ Biota ___

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **Yes**

L.P. Reviewer: Karen Kronoveter Date Completed: 02/11/04

Data Reviewer: Ansley Watson Date Completed: 8/3/03

Peer Reviewer: Stacey Coker Date Completed: 8/5/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Metals	Inorganic	VOC	SVOC	Explosives
GWW-2-T01N-GRW[3]	SA	526143		W	X	X			
GWW-2-D01N-GRW[3]	SA	526144		W	X				
MMW-45B-T01N-GRW	SA	526145		W	X	X			
MMW-45B-D01N-GRW	SA	526146		W	X				
MMW-44A-T01N-GRW	SA	526147	MMW-44A-GRW or MMW44AT01NGR	W	X	X	X	X	X
MMW-44A-D01N-GRW	SA	526148		W	X				
MMW-47A-T01N-GRW[3]	SA	526149	47A-GRW or MMW47AT01	W	X	X		X	X
MMW-47A-D01N-GRW[3]	SA	526150		W	X				
SPRING13PUMP-T01N-GRW	SA	526151		W	X	X			
SPRING13PUMP-D01N-GRW	SA	526152		W	X				
SPRING39PUMP-T01N-GRW	SA	526153		W	X	X			
SPRING39PUMP-D01N-GRW	SA	526154		W	X				
MMW-17B-T01N-GRW	SA	526155		W	X	X			
MMW-17B-D01N-GRW	SA	526156		W	X				
MMW-33A-T01N-GRW	SA	526157	MMW33AT01NGR	W	X	X			X
MMW-33A-D01N-GRW	SA	526158		W	X				
MMW-10A-T01N-GRW	SA	526159	MMW10AT01NGR	W	X	X			X
MMW-10A-D01N-GRW	SA	526160		W	X				
RB03T-GRW	RB	526161		W	X	X			
FB01T-GRW	FB	526162		W			X	X	X
TB213-GRW	TB	526163		W			X		
TB218-GRW	TB	526164		W			X		

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

[3]Additional volume submitted for matrix QC analyses.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality not covered in the review table below, were noted in the case narrative.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of samples, which were determined by the field pH determinations. The exception to this was the reporting of cadmium, cobalt, chromium, copper, nickel, and iron, which were reported from the 10 times dilution analysis. This modification was implemented to ensure a sufficient concentration of target elements to allow for a representative matrix spike analysis, as these elements were inadvertently not double spiked at the time of sample preparation.

Although the laboratory case narrative noted that some laboratory duplicate results yielded high RPD, in each case, the RPD was not the applicable evaluation criteria. In each case the absolute difference between the results was <1x RL. As such, the laboratory duplicate results are considered indicative of acceptance precision.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 1-2 and 15-16 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate. The 7-day collection to extraction holding time for semivolatile organic compounds (SVOCs) in sample MMW-47A-T01N-GRWRE was exceeded by 15 days. As such, all of the SVOC analytes in MMW-47A-T01N-GRWRE were qualified as estimated (UJ HT-I).
Laboratory Blank Reviews	No	Beryllium and copper were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS GWW-2-T01N-GRW GWW-2-D01N-GRW MMW-47A-T01N-GRW MMW-47A-D01N-GRW • LD GWW-2-T01N-GRW GWW-2-D01N-GRW MMW-47A-T01N-GRW MMW-47A-D01N-GRW	No	The matrix spike (MS) percent recovery for some analytes was out of limits in samples GWW-2-T01N-GRW and MMW-47A-T01N-GRW. Table 1.3 summarizes these MS results. Parent sample results were qualified, as appropriate, on the basis of MS results. The matrix quality control results for the May 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution GWW-2-T01N-GRW GWW-2-D01N-GRW MMW-47A-T01N-GRW MMW-47A-D01N-GRW	Yes	Several surrogate recoveries were low for the semivolatile organic compounds (SVOC) analysis of sample MMW-47A-T01N-GRW. The recoveries of 2-chlorophenol-d4, Nitrobenzene-d4, and 2-fluorobiphenyl were 32% (33-110), 32% (35-114), and 31% (43-116), respectively. These recoveries suggest a potential low bias in the associated sample results. Because 3 of 8 surrogate recoveries were outside acceptance ranges, the laboratory re-extracted and analyzed the sample. The surrogate recoveries

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
• Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance		for the reanalysis were all within acceptance criteria. Although the collection to extraction holding time was exceeded for the reanalysis, resulting in qualification of all SVOC results as estimated, the reanalysis data were considered to be of higher quality because all surrogate recoveries were within acceptance limits suggesting that a higher level of accuracy was attained on the reanalysis than for the original analysis. The serial dilution analyses were conducted on the matrix spike samples GWW-2-T01N-GRW, GWW-2-D01N-GRW, MMW-47A-T01N-GRW, and MMW-47A-D01N-GRW, pH class A. For samples GWW-2-T01N-GRW and GWW-2-D01N-GRW, the percent difference between the original copper result and the diluted copper result did not satisfy the ≤10% criterion and the copper results for these two samples were qualified as estimated. Table 1.4 summarizes these results. The serial dilution results for the May 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. Serial dilution results for samples MMW-47A-T01N-GRW and MMW-47A-D01N-GRW were not applicable for any analytes. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-45B-T01N-GRW and MMW-45B-D01N-GRW. Therefore, the molybdenum results for these samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample MMW-17B-T01N/D01N-GRW, the anion/cation (AC) balance was 23.7%, outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary for AC balance.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB03T-GRW • Field Blank (FB) FB01T-GRW • Trip Blank (TB) TB213-GRW TB218-GRW • Other (e.g., splits)	No	While no target analytes were detected in TB213-GRW, acetone was detected in TB218-GRW at 4 ug/l. Acetone was not detected in the associated sample, MMW-44A-T01N-GRW. As such, data qualification was not necessary. There were a few detections in the various field quality control blanks (RBs and FB). These are summarized in Tables 1.5 and 1.6. The field quality control results for the May 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	NA	

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	No	The initial calibration events for VOCs and SVOCs satisfied all linearity and response evaluation criteria; therefore no qualification was necessary. Table 1.7 summarizes continuing calibration results for which the drift criterion was not met and the resultant data qualifications. SVOC results for 3-nitroaniline (70.8) and carbazole (74.1) were qualified in all samples as estimated with the qualifier code: "ICV-L".
Laboratory Control Sample Results	No	The nitroaromatics analysis of laboratory control sample yielded a slightly low percent recovery (LCS=60%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (J/UJ LCS-L).
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Conductivity (umhos/cm)	pH
GWW-2-T01N-GRW	4.1 J	0.005 UJ	0.037 J	---	2100 J	4.7 J
MMW-45B-T01N-GRW	0.40 UJ	---	0.032 J	---	2460 J	4.4 J
MMW-44A-T01N-GRW	0.53 J	---	---	4590 J	3230 J	3.9 J
MMW-47A-T01N-GRW	2.1 J	---	---	---	1260 J	4.5 J
SPRING13PUMP-T01N-GRW	0.40 UJ	0.005 UJ	0.01 UJ	---	1550 J	4.9 J
SPRING39PUMP-T01N-GRW	1.8 J	0.005 UJ	0.01 UJ	---	1370 J	4.8 J
MMW-17B-T01N-GRW	0.40 UJ	---	---	---	771 J	5.1 J
MMW-33A-T01N-GRW	3.3 J	0.005 UJ	0.01 UJ	---	1790 J	4.6 J
MMW-10A-T01N-GRW	4.4 J	0.005 UJ	0.029 J	---	2150 J	4.5 J
RB03T-GRW	0.40 UJ	---	---	---	8.9 J	4.4 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P) DF=10	0.5	0.6	0.6	---	0.3	GWW-2-T01N-GRW, GWW-2-D01N-GRW, MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, MMW-17B-T01N-GRW, MMW-17B-D01N-GRW, MMW-33A-T01N-GRW, MMW-33A-D01N-GRW, MMW-47A-T01N-GRW, MMW-47A-D01N-GRW, SPRING13PUMP-T01N-GRW, SPRING13PUMP-D01N-GRW, SPRING39PUMP-T01N-GRW, SPRING39PUMP-D01N-GRW	U CCB-I
Copper (P) DF=10	---	---	-2.0	-1.6	1.5	MMW-17B-T01N-GRW, MMW-17B-D01N-GRW, RB03T-GRW	J/UJ CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Recovery Not Meeting Criteria

Sample/ Analytes	Matrix Spike Recovery	Acceptance Limits	Comment	Action
GWW-2-T01N-GRW				
Total Alkalinity	11.3%	75-125%	Acidic nature of sample (pH=4.7) neutralizes the bicarbonate spike resulting in reduced recovery. As such, the matrix spike results are not considered to be a valid measure of accuracy.	No qualification necessary
TKN	70%		NONE	Qualify parent sample UJ MS-L
Cyanide	6.8%		It was not considered necessary to reject the nondetect result for the parent sample due to the acidic nature of the sample (pH=4.5).	Qualify parent sample UJ MS-L
MMW-47A-T01N-GRW				
Nitrate as N	126.7%	75-125%	NONE	Qualify parent sample J MS-H
Orthophosphate	144.1%		High bias, nondetect parent sample result.	No qualification necessary.
Cyanide	24.0%		It was not considered necessary to reject the nondetect result for the parent sample due to the acidic nature of the sample (pH=4.5).	Qualify parent sample UJ MS-L
Sample/ Analytes	**Matrix Spike/ Matrix Spike Duplicate Recovery**	**Acceptance Limits**		**Action**
MMW-47A-T01N-GRW				
PYX	8% 6%	70-130%	NONE	Qualify parent sample R MS-L

Table 1.4
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Action
GWW-2-T01N-GRW		
Copper	12.5	Qualify parent sample J DL-L

Table 1.5
Positive Results for Rinsate Blanks

Analyte	RB03T-GRW
TDS (mg/L)	14.0
Chloride (mg/L)	0.42
Bicarbonate Alkalinity (mg/L)	2.7
Total Alkalinity (mg/L)	2.7
Ammonia (mg/L)	0.080

Table 1.6
Positive Results for Field Blanks

Analyte	FB03T-SOL
Bis (2-ethylhexyl) phthalate (µg/l)	1

Table 1.7
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
5/8/03 (1709)	Dichlorodiflouromethane 1,2-Dibromo-3-chloropropane 1,2,4-Trichlorobenzene	-30.4% 35.9% 32.4%	MMW-47A-T01N-GRW, FB01T-GRW, TB213-GRW, TB218-GRW	UJ CCAL-I
5/14/03 (0639)	Acetone 2-Hexanone	27.2% 62.5%	MMW-44A-T01N-GRW	UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
5/14/03 (1154)	4-chloro-3-methylphenol 4-nitrophenol Indeno (1,2,3-cd) pyrene Dibenzo (a,h) anthracene Benzo (g,h,i) perylene	-31.4% -56.5% 26.3% 27.8% 29.5%	MMW-44A-T01N-GRW, MMW-47A-T01N-GRW, FB01T-GRW	UJ CCAL-I
5/21/03 (0826)	4-chloro-3-methlphenol 3,3'-Dichlorobenzidine	-37.9% -37.3%	MMW-47A-T01N-GRWRE	UJ CCAL-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT106A Sampling Event: May 2003

Matrix: Solid ___Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 8/17/03

Peer Reviewer: Stacey Coker Date Completed: 8/03/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Metals	Inorganic	VOC	SVOC	Explosives
GWW-1-T01N-GRW	SA	526212		W	X	X			
GWW-1-D01N-GRW	SA	526213		W	X				
GWW-3-T01N-GRW	SA	526214		W	X	X			
GWW-3-D01N-GRW	SA	526215		W	X				
MMW-45A-T01N-GRW	SA	526216		W	X	X			
MMW-45A-D01N-GRW	SA	526217		W	X				
MMW-45A-T01D-GRW	FD	526218		W	X	X			
MMW-45A-D01D-GRW	FD	526219		W	X				
MMW-28A-T01N-GRW	SA	526220	MMW-28A-GRW MMW28AT01NGR	W	X	X	X	X	X
MMW-28A-D01N-GRW	SA	526221		W	X				
MMW-29A-T01N-GRW	SA	526222	MMW29AT01NGR	W	X	X			X
MMW-29A-D01N-GRW	SA	526223		W	X				
SPRING13-T01N-GRW	SA	526224		W	X	X			
SPRING13-D01N-GRW	SA	526225		W	X				
SPRING39-T01N-GRW	SA	526226		W	X	X			
SPRING39-D01N-GRW	SA	526227		W	X				
MMW-49A-T01N-GRW	SA	526228		W	X	X			
MMW-49A-D01N-GRW	SA	526229		W	X				
TB205-GRW	TB	526230		W			X		

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

Some results were reported from dilutions lower than those established between the client and the laboratory. Specifically aluminum, calcium, cadmium, cobalt, chromium, copper, iron, magnesium, potassium, sodium, manganese, zinc, and nickel which were reported from a 10x dilution rather than a 100x dilution for these samples. The reason for these exceptions is that the nondetect results obtained at a higher dilution were controlling the cation/anion balance calculation and yielding unacceptable results due to the use of the reporting limit for nondetect results.

The nitroaromatics analysis of laboratory control sample yielded a slightly low percent recovery (LCS=60%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time; therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples were qualified as estimated (UJ/J).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The 28-day holding time was exceeded by less than three days for fluoride. The analysis for pH and conductivity were exceeded by 1-2 and 15-16 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Antimony, copper, manganese, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Yes	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the May 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution GWW-1-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample GWW-1-T01N-GRW, pH class A, and was applicable for 4 out of 24 analytes. Recovery for internal standard Li was low for the ICPMS analysis of samples MMW-45A-T01N-GRW, MMW-29A-T01N-GRW, MMW-29A-D01N-GRW, SPRING13-T01N-GRW, SPRING13-T01N-GRW, MMW-49A-T01N-GRW, and MMW-49A-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. For sample GWW-3-T01N/D01N-GRW the dissolved analysis of lead exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.3 summarizes these results and the data qualification.
Field QC • Field Duplicate (FD) MMW-45A-T01D-GRW MMW-45A-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) TB205-GRW • Other (e.g., splits)	No	There were no detections in the field quality control blanks. The field quality control results for the May 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration. The initial calibrations for VOC and SVOC analyses met all evaluation criteria. However, some VOC and SVOC continuing calibration criteria were not satisfied. Table 1.4 summarizes continuing calibration results not meeting validation criteria and the resultant data qualifications. SVOC results for 3-nitroaniline (70.8) and carbazole (74.1) were qualified in all samples as estimated with the qualifier code: "ICV-L". • Explosives: Laboratory Control Sample. The percent recovery of the target compound PYX was less than the applied default range as noted in the case narrative discussion. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)	Fluoride (mg/L)	Conductivity (umhos/cm)	pH
GWW-1-T01N-GRW	4.1 J	0.005 UJ	0.017 J	---	1620 J	4.7 J
GWW-3-T01N-GRW	3.4 J	0.005 UJ	0.028 J	---	1830 J	4.6 J
MMW-45A-T01N-GRW	0.67 J	---	0.010 UJ	---	1570 J	5.4 J
MMW-45A-T01D-GRW	0.71 J	---	0.010 UJ	---	1560 J	4.2 J
MMW-28A-T01N-GRW	0.58 J	0.005 UJ	0.010 UJ	---	841 J	5.8 J
MMW-29A-T01N-GRW	3.9 J	0.005 UJ	0.011 J	---	1490 J	5.1 J
SPRING13-T01N-GRW	0.04 UJ	0.005 UJ	0.010 UJ	---	2040 J	4.2 J
SPRING39-T01N-GRW	0.78 J	0.005 UJ	0.010 UJ	---	1120 J	5.1 J
MMW-49A-T01N-GRW	3.4 J	---	0.029 J	25.5 J	1760 J	4.4 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (P) DF=10	-4.9		4.8	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-29A-T01N-GRW, MMW-29A-D01N-GRW, MMW-49A-T01N-GRW, MMW-49A-D01N-GRW, SPRING13-T01N-GRW, SPRING13-D01N-GRW, SPRING39-T01N-GRW, SPRING39-D01N-GRW	UJ CCB-L
Manganese (P) DF=10		10.3	9.0	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, SPRING39-D01N-GRW	U MB-I
Zinc (P) DF=10		8.8	2.5	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, SPRING39-T01N-GRW, SPRING39-D01N-GRW	U MB-I
Analyte		**MB (µg/l)**	**RL**	**Samples Qualified**	**Qualification Code**
1,2-Dibromo-3-chloropropane		5	10	MMW-28A-T01N-GRW	U MB-I
1,2,4-Trichlorobenzene		4	10	MMW-28A-T01N-GRW	U MB-I

P=ICP MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instument Detection Limit

RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Dissolved Qualifications for Metals

Sample/Analytes	Absolute Difference	RL	Action
GWW-3-T01N/D01N-GRW			
Lead	11.7	1.0	Results for these analytes in sample GWW3-T01N/D01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.

Table 1.4
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
5/8/03 (1709)	Dichlorodiflouromethane 1,2-Dibromo-3-chloropropane 1,2,4-Trichlorobenzene	-30.4% 35.9% 32.4%	Results for these analytes in associated samples were qualified as estimated.	UJ/J CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
5/14/03 (0712)	4-Chloro-3-methylphenol 4-Nitrophenol Indeno(1,2,3-cd) pyrene Dibenz (a,h) anthracene Benzo (g,h,i) perylene	-31.4% -56.5% 26.3% 27.8% 29.5%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT107C Sampling Event: May 2003

Matrix: Solid ___Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 7/30/03

Peer Reviewer: Stacey Coker Date Completed: 7/31/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses		
					Metals	Inorganics	BOD/COD
RR-US-SPRING13-T01N-SFW	SA	526276	RRUSSPG13T01NSFW	W	X	X	X
RR-US-SPRING13-D01N-SFW	SA	526277	RRUSSPG13D01NSFW	W	X		
RR-DS-SPRING39-T01N-SFW	SA	526278	RRDSSPG39T01NSFW	W	X	X	X
RR-DS-SPRING39-D01N-SFW	SA	526279	RRDSSPG39D01NSFW	W	X		
RR-DS-SPRING13-T01N-SFW	SA	526280	RRDSSPG13T01NSFW	W	X	X	X
RR-DS-SPRING13-D01N-SFW	SA	526281	RRDSSPG13T01NSFW	W	X		
RR-US-SPRING39-T01N-SFW	SA	526282	RRUSSPG39T01NSFW	W	X	X	X
RR-US-SPRING39-D01N-SFW	SA	526283	RRUSSPG39D01NSFW	W	X		
RR-US-SPRING39-T01D-SFW	FD	526284	RRUSSPG13T01DSFW	W	X	X	X
RR-US-SPRING39-D01D-SFW	FD	526285	RRUSSPG13D01DSFW	W	X		
RB01T-SFW	RB	526286		W	X	X	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The metals analyses of the continuing calibration verification (CCV) standard associated with the samples in this SDG yielded a percent recovery for iron of 88.7% (CCV3), which is marginally below the control criteria (90-110%). The associated iron results were reported by the laboratory because they compared well with iron results from a different run. As such, the iron results for all samples associated with CCV3 have been qualified as estimated (UJ/J). The data from this additional analytical sequence was included in the submittal.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The field IDs RR-US-SPRING13-T01N/D01N-SFW, RR-US-SPRING39-T01N-D01N-SFW, RR-DS-SPRING13-T01N/D01N-SFW, and RR-DS-SPRING39-T01N/D01N-SFW were truncated to RRUSSPRING13T01N/D01NSFW, RRUSSPRING39T01N/D01NSFW, RRDSSPRING13T01N/D01NSFW, and RRDSSPRING39T01N/D01NSFW upon sample log-in.
Holding Times	No	The 48-hour holding time was exceeded for nitrate as N by 4 days and less than 48 hours for nitrate as N and orthophosphate. The 28-day phosphorus holding time was exceeded by 1 day for one sample due to necessary re-analyses and by one day for another sample due to laboratory error. The analysis for pH and conductivity were exceeded by 2 and 11 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, copper, iron, molybdenum, nickel, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RR-US-SPRING13-T01N-SFW RR-US-SPRING13-D01N-SFW • LD RR-US-SPRING13-T01N-SFW RR-US-SPRING13-D01N-SFW	No	The matrix spike (MS) percent recovery for sulfate was out of limits in sample RR-US-SPRING13-T01N-SFW. Table 1.3 summarizes these MS results. The MS results for the May 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The results in the parent sample were qualified.
Method QC • Surrogates • Serial Dilution RR-US-SPRING13-T01N-SFW RR-US-SPRING13-D01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analyses were conducted on samples RR-US-SPRING13-T01N-SFW and RR-US-SPRING13-D01N-SFW (pH class C). The results were applicable for 13 out of 24 metals. All %D for applicable analytes were within the acceptance range of <10%. The serial dilution results for the May 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Field QC • Field Duplicate (FD) RR-US-SPRING39-T01D-SFW RR-US-SPRING39-D01D-SFW RR-US-SPRING39-D01D-SFW • Rinsate Blank (RB) RB01T-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	For samples RR-US-SPRING39-T01D-SFW AND RR-US-SPRING39-T01N-SFW, the TDS field duplicate result exceeded evaluation criteria. The TDS results were qualified as estimated (J FD-I). The field quality control results for the May 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the laboratory performance reviews, the following additional parameters were evaluated: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Phosphorus (mg/L)	Conductivity (umhos/cm)	pH
RRUSSPG13T01NSFW	0.40 UJ	0.005 UJ	0.010 UJ	0.37 J	222 J	7.9 J
RRDSSPG39T01NSFW	0.40 UJ	0.005 UJ	0.010 UJ	---	237 J	8.0 J
RRDSSPG39T01NSFW	0.40 UJ	0.005 UJ	0.010 UJ	---	221 J	7.5 J
RRUSSPG39T01NSFW	0.40 UJ	0.005 UJ	0.010 UJ	---	210 J	7.4 J
RRUSSPG13T01NSFW	0.40 UJ	0.005 UJ	0.010 UJ	---	210 J	7.3 J
RB01T-SFW	0.40 UJ	0.005 UJ	0.010 UJ	0.013 J	1.7 J	4.0 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P) DF=1	69.3	86.7				50.3	RB01T-SFW, RR-DS-SPG13-D01N-SFW, RR-DS-SPG39-D01N-SFW, RR-US-SPG13-D01N-SFW, RR-US-SPG39-D01N-SFW, RR-US-SPG39-D01D-SFW	U CCB-I
Antimony (MS) DF=1		0.4	0.5	0.4	0.4	0.3	RR-DS-SPG13-D01N-SFW, RR-DS-SPG13-T01N-SFW, RR-DS-SPG39-T01N-SFW	U CCB-I
Copper (P) DF=1	-2.1	-3.3				1.5	All the samples in this package	UJ/J CCB-L
Iron (P) DF=1	40.3					31.1	RR-DS-SPG13-D01N-SFW, RR-DS-SPG39-D01N-SFW, RR-US-SPG13-D01N-SFW, RR-US-SPG39-D01N-SFW, RR-US-SPG39-D01D-SFW	U CCB-I
Molybdenum (P) DF=1	3.3					2.3	RR-US-SPG39-T01N-SFW	U CCB-I
Nickel (P) DF=1		-3.1				3.0	RB01T-SFW, RR-DS-SPG13-T01N-SFW, RR-DS-SPG13-D01N-SFW, RR-DS-SPG39-T01N-SFW, RR-DS-SPG39-D01N-SFW, RR-US-SPG39-T01N-SFW RR-US-SPG39-D01N-SFW, RR-US-SPG39-T01D-SFW, RR-US-SPG39-D01D-SFW	UJ/J CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike, Matrix Spike Duplicate,
and Post Digestion Spike Recovery Not Meeting Criteria

Sample/Analytes	Matrix Spike Recovery	Matrix Spike Duplicate Recovery	Post Digestion Spike Recovery	Acceptance Limits	Action
RR-US-SPG13-T01N-SFW					
Sulfate	74%	NA	NA	75-125%	Qualify parent sample J MS-L

NA = Not appropriate

ND = Nondetect

RL = Reporting limit (generally the IDL adjusted for dilution)

IDL = Instrument detection limit

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT108C Sampling Event: May 2003 Groundwater

Matrix: Solid __ Water X Biota __

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Karen Kronoveter Date Completed: 06/16/03

Peer Reviewer: Stacey Coker Date Completed: 06/17/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses					
					Metals	Inorganics	VOCs	SVOCs	pH	Conductivity
*MW-17-T01N-GRW	SA	526388	MW-17-GRW MW-17-T01NGRW	W	X	X	X	X	X	X
*MW-17-D01N-GRW	SA	526389		W	X					
CC-2A-T01N-GRW	SA	526390		W	X	X			X	X
CC-2A-D01N-GRW	SA	526391		W	X					
CC-1B-T01N-GRW	SA	526392		W	X	X			X	X
CC-1B-D01N-GRW	SA	526393		W	X					
CC-2B-T01N-GRW	SA	526394		W	X	X			X	X
CC-2B-D01N-GRW	SA	526395		W	X					
MW-23-T01N-GRW	SA	526396		W	X	X			X	X
MW-23-D01N-GRW	SA	526397		W	X					
TPZ-1-T01N-GRW	SA	526398		W	X	X			X	X
TPZ-1-D01N-GRW	SA	526399		W	X					
TB215-GRW	TB	526400		W			X			

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank
FD = Field Duplicate
[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW108C, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified on the quantitation reports. Included in the data package were the extracted ion current profiles.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	Upon sample receipt and log-in, it was noted that one of the 40mL vials (H_2SO_4 preserved) for sample MW-23-T01N-GRW was received broken. This reduction in volume did not adversely affect the analyses run on this sample. No data qualification was necessary and completeness was not affected.
Holding Times	No	The 48-hour holding times for nitrite, and orthophosphate were exceeded by several hours for all samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). As mentioned in the laboratory's case narrative, the nitrate analyses for the samples in this delivery group were conducted 2 days beyond the prescribed analytical holding time of 48 hours due to a malfunction of the IC instrument autosampler device. Consequently, all nitrate results were qualified as estimated (J/UJ). The sulfate result reported for sample CC-2A-T01N-GRW was from a reanalysis- run due to an analyst error in the calculation of the initial result. Due to the fact that the reported sulfate result for this sample was analyzed seven days beyond the analytical holding time of 28 days, the result was qualified as estimated (J) on the basis of holding time exceedance. The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 15 days after sampling and 12 days beyond log-in. The pH for all samples was measured approximately five hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2a summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. Several target analytes were detected in the volatile organic method blank associated with this data set. Table 1.2b summarizes the volatile blank detections and the resultant data qualifications (limited to those analytes and samples requiring qualification). Several tentatively identified compounds were reported as present in the semivolatile blank SBLKE4. TICs in method blanks are not considered to be reportable as TICs for samples and such results were flagged as unusable (R). The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the May 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MW-17-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample MW-17-T01N-GRW was not applicable for 23 of the 24 metal analytes, as the initial sample results for only one analyte (molybdenum) was sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent difference between the initial sample result and the serial dilution result (5x), was compared to an evaluation criteria of ±10% for molybdenum. The reported % difference for molybdenum was 0.5%, thereby removing the necessity to qualify any data on the basis of serial dilution. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank TB215-GRW	Yes	No analytes were detected in the trip blank TB215-GRW associated with volatile organic sample in this package. The Field QC results for the May 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial Calibration • VOCs/SVOCs: Continuing Calibration Tables 1.3 summarizes the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. SVOC results for 3-nitroaniline (70.8) and carbazole (74.1) were qualified in all samples as estimated with the qualifier code: "ICV-L".

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	SO_4^{2-}	Ortho-P	Cond.	pH
MW-17-T01N-GRW	0.40 J	0.0050 UJ	---	0.010 UJ	676 J	7.6 J
CC-2A-T01N-GRW	0.40 UJ	0.0050 UJ	559 J	0.010 UJ	1190 J	6.2 J
CC-1B-T01N-GRW	0.40 UJ	0.0050 UJ	---	0.010 UJ	558 J	7.2 J
CC-2B-T01N-GRW	0.40 UJ	0.0050 UJ	---	0.010 UJ	570 J	7.1 J
MW-23-T01N-GRW	0.80 J	0.0085 J	---	0.010 UJ	399 J	7.6 J
TPZ-T01N-GRW	0.79 J	0.0050 UJ	---	0.010 UJ	876 J	7.8 J

Table 1.2a
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	0.6	0.5	0.6	---	---	---	0.30	None of the sample results were qualified, as all were nondetect for Sb	---
Beryllium (P)	---	0.4	0.4	---	---	-0.498	0.30	All samples with the **exception** of: CC-2A-D01N-GRW CC-2A-T01N-GRW	UJ MB-L
Iron (P)	49.8	---	---	---	---	---	42.2	None of the sample results were qualified for Fe, as the results were either nondetect or greater than 5x the blank detection	---
Manganese (P)	2.0	---	---	---	1.6	---	1.3	MW-17-D01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2a
Volatile and Semivolatile Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (µg/kg)	Samples Qualified	Qualification and Qualification Codes
VBLKA4	05/08/03	1,2-Dibromo-3-chloropropane	5	Results for both of these analytes in the two VOA samples were nondetect	---
		1.2,4-Trichlorobenzene	4		
SBLKP2	05/14/03	2-Pentanone, 4-Hydroxy-4-Methyl[1,2]	3 NJA	MW-17-T01N-GRW	R

[1]Compound is a tentatively identified compound (TIC). TICs in method blanks are not considered to be reportable as TICs for samples.

[2]Compound is a suspected aldol condensation product of acetone.

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% RSD >30%	Action	Qualification and Qualification Codes
VOC	05/08/03 (1709)	Dichlorodiflouromethane	-30.4	MW-17-T01N-GRW TB215-GRW	UJ CCAL-I
		1,2-Dibromo-3-chloropropane	35.9		
		1,2,4-Trichlorobenzene	32.4		
SVOC	05/14/03 (0712)	4-Chloro-3-methylphenol	-31.4	MW-17-T01N-GRW	UJ CCAL-I
		4-Nitrophenol	-56.5		
		Indeno(1,2,3-cd)pyrene	26.3		
		Dibenz(a,h) anthracene	27.8		
		Benzo(g,h,I)pyrene	29.5		

CCAL = Initial Calibration %D = Percent Difference

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT109A Sampling Event: May 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 07/18/03

Peer Reviewer: Stacey Coker Date Completed: 07/18/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	pH	Conductivity
MMW-48A-T01N-GRW	SA	526483	MMW48AT1NGRW 48AT01NGRW MW48AT01NGRW	W	X	X	X	X	X	X	X
MMW-48A-D01N-GRW	SA	526484		W	X						
MMW-48A-T01D-GRW	FD	526485	MMW48AT1DGRW 48AT01DGRW MW48AT01DGRW	W	X	X	X	X	X	X	X
MMW-48A-D01D-GRW	FD	526486		W	X						
MMW-27A-T01N-GRW	SA	526487	MMW27AT01NGRW	W	X	X			X	X	X
MMW-27A-D01N-GRW	SA	526488		W	X						
MMW-17A-T01N-GRW	SA	526489		W	X	X				X	X
MMW-17A-D01N-GRW	SA	526490		W	X						
TB214-GRW	TB	526491		W			X				

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

A volatile organic holding blank was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank, HBW109A, were all nondetect indicating that the occurrence of potential cross-contamination during sample storage was unlikely.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified by the laboratory on the quantitation reports. Included in the data package were the extracted ion current profiles.

The nitroaromatic analysis of the blank spike sample U7LCS yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded a recovery of 60%. The laboratory has not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples were qualified as estimated (UJ) with a low bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	Upon sample receipt and log-in, it was noted that sample MMW-27A-T01N-GRW was not marked off on the chain of custody for explosives analysis. However, because a sample volume was received for explosives analysis, it was analyzed. No data qualification was necessary and completeness was not affected.
Holding Times	No	The 48-hour holding times for nitrate, nitrite, and orthophosphate were exceeded by several hours for all samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 13 days after sampling and 11 days beyond log-in. The pH for all samples was measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2a summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. Several tentatively identified compounds were reported as present in the semivolatile blank SBLKP2. TICs in method blanks are not considered to be reportable as TICs for samples and such results were flagged as unusable (R). The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associated numerical value represents its approximate value.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the May 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (A) MMW-48A-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis on sample MMW-48A-T01N-GRW was not applicable for 19 of the 24 metal analytes, as the initial sample results for only five analytes were sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent differences (%Ds) between the initial sample results and the serial dilution results (5x) were compared to an evaluation criteria of ±10% for the other five analytes. All reported %Ds were less than 10%. It was therefore not necessary to qualify any results on the basis of serial dilution. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate MMW-48A-T01D-GRW MMW-48A-D01D-GRW • Rinsate Blank • Field Blank • Trip Blank TB214-GRW	Yes	No analytes were detected in the trip blank TB214-GRW associated with volatile organic samples in this package. The field QC results for the May 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial Calibration • VOCs/SVOCs: Continuing Calibration • Metals: Interference Check Sample Results Tables 1.3a and 1.3b summarized the initial and continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. SVOC results for 3-nitroaniline (70.8) and carbazole (74.1) were qualified in all samples as estimated with the qualifier code: "ICV-L." As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH
MMW-48A-T01N-GRW	0.40 UJ	0.0050 UJ	0.11 J	3360 J	5.5 J
MMW-48A-T01D-GRW	0.40 UJ	0.0050 UJ	0.11 J	3350 J	5.5 J
MMW-27A-T01N-GRW	4.5 J	0.0050 UJ	0.038 J	2280 J	4.5 J
MMW-17A-T01N-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	737 J	4.7 J

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Cadmium (P)	---	---	---	---	---	0.567	0.4	MMW-48A-D01N-GRW MMW-48A-T01D-GRW MMW-48A-T01N-GRW	U MB-I
Iron (P)	---	-50.8	-50.1	-64.8	32.5	62.250	29.9	MMW-17A-D01N-GRW MMW-17A-T01N-GRW MMW-27A-D01N-GRW MMW-27A-T01N-GRW	UJ CCB-L
Lead (MS)	---	---	---	---	---	-1.337	0.1	All samples	UJ MB-L J MB-L
Molybdenum (P)	---	---	---	---	---	1.950	1.6	MMW-48A-T01N-GRW	U MB-I
Potassium (P)	378.0	---	---	---	---	---	327.4	MMW-48A-D01D-GRW MMW-48A-D01N-GRW MMW-48A-T01D-GRW MMW-48A-T01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3a
Initial Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% RSD >30%	Action	Qualification and Qualification Codes
VOC	04/07/03 (1234)	2-Hexanone	50.0	Results for this analyte in all three samples were qualified as estimated.	UJ ICAL-I

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.3b
Continuing Calibration Results
Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% RSD >30%	Action	Qualification and Qualification Codes
VOC	05/14/03 (0639)	2-Hexanone	62.5	Results for this analyte in all three samples were qualified as estimated	UJ CCAL-I
SVOC	05/14/03 (0712)	4-Chloro-3-methylphenol	-31.4	Results for these analytes in both semivolatile samples were qualified as estimated	UJ CCAL-I
		4-Nitrophenol	-56.5		
		Indeno(1,2,3-cd)pyrene	26.3		
		Dibenz(a,h) anthracene	27.8		
		Benzo(g,h,I)pyrene	29.5		

CCAL = Initial Calibration %D = Percent Difference

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT110C Sampling Event: May 2003

Matrix: Solid ___Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 6/13/03

Peer Reviewer: Stacey Coker Date Completed: 6/17/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganic
MW-21-T01N-GRW	SA	526505		W	X	X
MW-21-D01N-GRW	SA	526506		W	X	
TPZ-2-T01N-GRW	SA	526507		W	X	X
TPZ-2-D01N-GRW	SA	526508		W	X	
TPZ-6U-T01N-GRW	SA	526509		W	X	X
TPZ-6U-D01N-GRW	SA	526510		W	X	
CC-1A-T01N-GRW	SA	526511		W	X	X
CC-1A-D01N-GRW	SA	526512		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

The metals analyses in this SDG were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of samples, which were determined by the field pH determinations.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory received a limited volume for sample CC-1A-T01N-GRW due to an extremely low purge rate and poor producing nature of the well. The analysis parameters were prioritized and it was decided to forego the total organic carbon, total suspended solids, and cyanide analyses.
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. Also the holding time for pH for one sample was inadvertently exceeded by 10 days. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Antimony, beryllium, iron, and manganese were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Not Applicable	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the May 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MW-21-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	Although serial dilutions tests were conducted for each analyte, the native sample concentration were <50x IDLs. Therefore the serial dilution results are not considered appropriate for assessing interferences. Recovery for internal standard Y was high for the ICPMS analysis of sample CC-1A-T01N-GRW. Therefore, the molybdenum result for this sample was reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Not Applicable	Although this package did not include any field QC samples, the QAPP required QC frequency was met for the May sampling event. The field QC results for the May 2003 sampling event will be assessed collectively and any resultant data qualification will be summarized in the overall assessment for the sampling event.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The analytical package was evaluated for completeness. During this evaluation it was noted that phosphorus was inadvertently reported as phosphate. The phosphate line was crossed out and correctly revised by hand on the original Form 1.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Not Applicable	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)	pH (mg/L)
MW-21-T01N-GRW	9.0 J	0.016 J	0.010 UJ	---
TPZ-2-T01N-GRW	0.40 UJ	0.005 UJ	0.010 UJ	8.0 J
CC-1A-T01N-GRW	0.40 UJ	0.005 UJ	0.01 UJ	---

Table 1.2
Method Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS) DF=2	0.7	0.5	0.6		0.3	MW-21-T01N-GRW	U CCB-I
Beryllium (P) DF=1		0.4	0.4	-0.445	0.3	CC-1A-T01N-GRW, MW-21-T01N-GRW, MW-21-D01N-GRW, TPZ-2-T01N-GRW, TPZ-2-D01N-GRW, TPZ-6U-T01N-GRW, TPZ-6U-D01N-GRW	UJ CCB-L
Iron (P) DF=10	49.8				42.2	MW-21-T01N-GRW, TPZ-6U-D01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT111C Sampling Event: April 2003

Matrix: Solid ___Water _X_ Biota ___

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Ansley Watson Date Completed: 7/10/03

Peer Reviewer: Stacey Coker Date Completed: 7/15/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
COLUMBINE CAMPGROUND WELL#1-T01N-GRW	SA	526662	COLCGWELL#1-T01N-GRW or COLCGWELL#1-T01N-GR	W	X	X
COLUMBINE CAMPGROUND WELL#1-D01N-GRW	SA	526663	COLCGWELL#1-D01N-GRW or COLCGWELL#1-D01N-GR	W	X	
TPZ-7L-T01N-GRW	SA	526664		W	X	X
TPZ-7L-D01N-GRW	SA	526665		W	X	
TPZ-5B-T01N-GRW	SA	526666		W	X	X
TPZ-5B-D01N-GRW	SA	526667		W	X	
EMBARGO ROAD SEEP-T01N-GRW	SA	526668	EMBARGOSEEP-T01N-GRW or EMBARGOSEEP-T01N-G	W	X	X
EMBARGO ROAD SEEP-D01N-GRW	SA	526669	EMBARGOSEEP-D01N-GRW or EMBARGOSEEP-D01N-G	W	X	
CHAMBERS SPRING-T01N-GRW	SA	526670	CHAMBERSSPRG-T01N-GRW Or CHAMBERSSPRG-T01N-	W	X	X
CHAMBERS SPRING-D01N-GRW	SA	526671	CHAMBERSSPRG-D01N-GRW Or CHAMBERSSPRG-D01N-	W	X	
TPZ-5U-T01N-GRW	SA	526672		W	X	X
TPZ-5U-D01N-GRW	SA	526673		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time was exceeded for nitrate as N, nitrite as N, and orthophosphate by 1-2 days for various samples. The analysis for pH and conductivity were exceeded by 2 and 11 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Antimony, beryllium, iron, lead, and manganese were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Not Applicable	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution COLCGWELL#1-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis on sample COLCGWELL#1-T01N-GRW, pH class C, was applicable for 1 out of 24 analytes. For samples TPZ-7L-T01N-GRW, and TPZ-7L-D01N-GRW the dissolved analysis molybdenum exceeded that of the total analysis of molybdenum. Table 1.3 summarizes these results and the data qualifications issued.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Not Applicable	This package did not include any site-specific field quality control samples. The field quality control results for the April 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the laboratory performance reviews, the following additional parameters were evaluated: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications

Sample	Nitrate (mg/L)	Orthophosphate (mg/L)	Nitrite (mg/L)	Conductivity (umhos/cm)	pH
COLCGWELL#1-T01N-GRW	---	---	---	159 J	7.1 J
TPZ-7L-T01N-GRW	---	0.022 J	0.26 J	284 J	8.3 J
TPZ-5B-T01N-GRW	0.4 UJ	0.010 UJ	0.011 J	742 J	7.6 J
EMBARGOSEEP-T01N-GRW	---	0.018 J	0.005 UJ	1480 J	7.5 J
CHAMBERSSPRG-T01N-GRW	---	---	---	249 J	8.1 J
TPZ-5U-T01N-GRW	0.4 UJ	0.034 J	0.034 J	626 J	7.4 J

Table 1.2
Method Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS) DF=2	0.7	0.8	0.8	0.9		0.3	COLCGWELL#1-T01N-GRW	U CCB-I
Beryllium (P) DF=1			0.4			0.3	TPZ-7L-T01N-GRW	U CCB-I
Iron (P) DF=10		-48.7			-44.3	42.2	CHAMBERSSPRG-T01N-GRW, CHAMBERSSPRG-D01N-GRW, COLCGWELL#1-T01N-GRW, COLCGWELL#1-D01N-GRW, EMBARGOSEEP- T01N-GRW, EMBARGOSEEP-D01N-GRW, TPZ-5B-D01N-GRW, TPZ-5U-T01N-GRW, TPZ-5U-D01N-GRW, TPZ-7L-D01N-GRW	UJ/J CCB-L
Lead (MS) DF=2					-2.0	0.1	CHAMBERSSPRG-T01N-GRW, CHAMBERSSPRG-D01N-GRW, COLCGWELL#1-D01N-GRW, EMBARGOSEEP- T01N-GRW, EMBARGOSEEP-D01N-GRW, TPZ-5B-D01N-GRW, TPZ-5U-T01N-GRW, TPZ-5U-D01N-GRW, TPZ-7L-D01N-GRW	UJ/J MB-L
Manganese (P) DF=10		-2.9	-1.4	-1.6	-2.1	1.3	CHAMBERSSPRG-T01N-GRW, CHAMBERSSPRG-D01N-GRW, COLCGWELL#1-T01N-GRW, COLCGWELL#1-D01N-GRW, EMBARGOSEEP- T01N-GRW, EMBARGOSEEP-D01N-GRW, TPZ-5U-T01N-GRW, TPZ-5U-D01N-GRW	UJ/J CCB, MB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Sample results %D greater than 30%	RL	Action
TPZ-7L-T01N/D01N-GRW • Molybdenum	67.7 92.0	2.3	Results for these analytes in the TPZ-7L-T01N-GRW in this package were qualified as estimated. The bias direction is considered to be indeterminate.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT112A Sampling Event: May 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 7/15/03

Peer Reviewer: Stacey Coker Date Completed: _____

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
SPRING15M-T01N-GRW	SA	526674		W	X	X
SPRING15M-D01N-GRW	SA	526675		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issue was noted in the case narrative.

Some results were reported from dilutions lower than those established between the client and the laboratory. Specifically aluminum, calcium, cadmium, cobalt, chromium, iron, potassium, sodium, manganese, sodium, zinc, and nickel which were reported from a 10x dilution rather than a 100x dilution for these samples. The reason for these exceptions is that the nondetect results obtained at a higher dilution were controlling the cation/anion balance calculation and yielding unacceptable results due to the use of the reporting limit for nondetect results.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The analysis for pH and conductivity were exceeded by 2 and 12 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, antimony, cadmium, chromium, iron, lead, manganese, and molybdenum were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	No	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the May 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution SPRING15M-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis on samples SPRING15M-T01N-GRW, pH class A, was applicable for 3 out of 24 analytes.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Not Applicable	This package did not include any site-specific field quality control samples. The field quality control results for the May 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the laboratory performance reviews, the following additional parameters were evaluated: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH
SPRING15M-T01N-GRW	1000 J	4.6 J

Table 1.2
Method Blank Detections Resulting in Data Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Cadmium (P) DF=10			0.6	0.4	SPRING15M-T01N-GRW, SPRING15M-D01N-GRW	U MB-I
Iron (P) DF=10	-50.8	-50.1	62.3	29.9	SPRING15M-T01N-GRW, SPRING15M-D01N-GRW	UJ CCB,MB-L
Lead (MS) DF=10			-1.3	0.1	SPRING15M-T01N-GRW, SPRING15M-D01N-GRW	UJ MB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA VALIDATION REPORT
FOR THE
JUNE 2003 GROUNDWATER AND SURFACE WATER SAMPLING EVENT DATA

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004

URS

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141233

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Holding Blanks 3-1
3.2.2 Manual Integration 3-1
3.2.3 Low-Level Detections 3-1
3.2.4 TICS Reported In Blanks 3-1
3.2.5 Dilution Schemes/Non-Detects With Elevated RLs 3-2
3.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses: 3-2
3.2.7 Non-Valid Matrix Spikes 3-2
3.2.8 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Assessment of Matrix QC Results 4-1

4.1 Organic Matrix Spike Results (Accuracy/Precision Evaluation) 4-2
4.2 Inorganic Matrix Spike Results (Accuracy Evaluation) 4-2
4.2.1 Post-Digestion Spikes 4-5
4.3 Inorganic Laboratory Duplicate Results (Precision Evaluation) 4-5
4.4 ICP Serial Dilution Results 4-6

Section 5 Collective Assessment of Field QC Results 5-1

5.1 Field Duplicate Agreement 5-1
5.2 Rinsate Blank Results 5-2
5.3 Field Blank Results 5-4
5.4 Trip Blank Results 5-4

Section 6 Overall Data Quality Indictor Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-2
6.3 Completeness 6-2
6.4 Representativeness 6-3
6.5 Comparability 6-3
6.6 Sensitivity 6-3

TABLE OF CONTENTS

List of Tables

Table 1-1 Summary of Groundwater Samples Collected June 2003

Table 1-2 Summary of Surface Water Samples Collected June 2003

Table 4-1 Field Samples Designated for Matrix QC Analysis

Table 4-2 Frequency Requirements for Matrix QC

Table 4-3 Organics Matrix Spike Results

Table 4-4 Inorganics Matrix Spike Results

Table 4-5 Metals Matrix Spike Results

Table 4-6 Inorganic Laboratory Duplicate Results

Table 4-7 ICP Serial Dilution Results

Table 4-8 ICP Serial Dilution Overall Assessment

Table 5-1 Summary of Field Duplicate Samples Collected June 2003

Table 5-2 Field Duplicate Collection Frequency for the June 2003 Sampling Event

Table 5-3 Summary of Rinsate Blank Samples Collected June 2003

Table 5-4 Summary of Rinsate Blank Results and Additional Qualifications

Table 5-5 Summary of Field Blank Samples Collected June 2003

Table 6-1 Summary of Precision Assessment for June 2003

Table 6-2 Summary of Accuracy Assessment for June 2003

List of Attachments

Attachment 1.1 Data Package WAT113C

Attachment 1.2 Data Package WAT114C

Attachment 1.3 Data Package WAT115A

Attachment 1.4 Data Package WAT116A

Attachment 1.5 Data Package WAT117C

Attachment 1.6 Data Package WAT118A

Attachment 1.7 Data Package WAT119A

Attachment 1.8 Data Package WAT120C

Attachment 1.9 Data Package WAT121C

This Data Validation Report (DVR) provides a general overview of the usability of the surface and groundwater chemical data obtained during the June 2003 sampling event at Molycorp Questa Mine in Questa, New Mexico. This report contains the results and process of the sample specific data reviews and collective evaluations for the water samples collected in support of the Remedial Investigation/Feasibility Study (RI/FS) during the month of June, 2003.

June 2003 RI/FS water samples were submitted to Severn Trent Laboratories (STL) Burlington in Colchester, Vermont for chemical analysis. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods utilized were according to the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). Sample and QC results were reported in nine original packages.

Tables 1-1 and 1-2 summarize the groundwater and surface water samples collected during this sampling event, along with the analyses performed on each sample and the accompanying QC samples.

Table 1-1
Summary of Groundwater Samples Collected June 2003

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
003EASTSEEP-T01N-GRW (WAT120C)	X	X	X	---	---	---
003WESTSEEP-T01N-GRW (WAT120C)	X	X	X	---	---	---
CabinSprings-T01N-GRW (WAT121C)	X	X	X	---	---	---
CC1A-T01N-GRW (WAT118A)	X	X	X	---	---	---
CC1B-T01N-GRW (WAT118A)	X	X	X	---	---	---
CC2A-T01N-GRW (WAT118A)	X	X	X	---	---	---
CC2B-T01N-GRW (WAT118A)	X	X	X	---	---	---
COLCG1-T01N-GRW (WAT114C)	X	X	X	---	----	X
EASTSEEP-T01N-GRW (WAT120C)	X	X	X	---	---	---
ELEROCKCGWELL1-T01N-GRW (WAT114C)	X	X	X	---	---	---
GWW-1-T01N-GRW (WAT118A)	X	X	X	---	---	---
GWW-2-T01N-GRW (WAT118A)	X	X	X	---	---	---
GWW-3-T01N-GRW (WAT116A)	X	X	X	---	---	---
MMW-10A-T01N-GRW (WAT116A)	X	X	X	---	---	X
MMW-16-T01N-GRW (WAT118A)	X	X	X	---	---	X
MMW-17A-T01N-GRW (WAT115A)	X	X	X	---	---	---
MMW-17B-T01N-GRW (WAT115A)	X	X	X	---	---	---
MMW-28A-T01N-GRW (WAT114C)	X, MS, LD	X, MS, LD	X, MS, LD	X, MS, MSD	X, MS, MSD	X, MS, MSD
MMW-29A-T01N-GRW (WAT116A)	X	X	X	---	---	X
MMW-31B-T01N-GRW (WAT115A)	X	X	X	---	X	---
MMW-33A-T01N-GRW (WAT116A)	X	X	X	---	---	X
MMW-42B-T01N-GRW (WAT113C)	X	X	X	---	---	---
MMW-44A-T01N-GRW (WAT116A)	X	X	X	X	X	X
MMW-44B-T01N-GRW (WAT113C)	X	X	X	X, FB	X, FB	X, FB
MMW-45A-T01N-GRW (WAT115A)	X, FD	X, FD	X, FD	---	---	---
MMW-45B-T01N-GRW (WAT116A)	X, RB	X, RB	X, RB	---	---	---
MMW-47A-T01N-GRW (WAT115A)	X, FD	X, FD	X, FD	X, FD	X, FD	X, FD
MMW-48A-T01N-GRW (WAT115A)	X, RB	X, RB	X, RB	X, RB	X, RB	X, RB
MMW-49A-T01N-GRW (WAT118A)	X	X	X	---	---	---

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
MW-1-T01N-GRW (WAT113C)	X, MS, LS	X, MS, LD	X, MS, LD	---	---	---
MW-17-T01N-GRW (WAT113C)	X	X	X	X	X	---
MW-20-T01N-GRW (WAT114C)	X	X	X	---	---	---
MW-21-T01N-GRW (WAT113C)	X	X	X	---	---	---
MW-23-T01N-GRW (WAT117C)	X, FD	X, FD	X, FD	---	---	---
MW-24-T01N-GRW (WAT113C)	X, RB	X, RB	X, RB	---	---	---
MW-9A-T01N-GRW (WAT114C))	X	X	X	---	---	---
P-4A-T01N-GRW (WAT115A)	X	X	X	---	---	X
P-5A-T01N-GRW (WAT115A)	X	X	X	---	---	X
SC-1A-T01N-GRW (WAT116A)	X	X	X	---	---	---
SC-1B -T01N-GRW (WAT116A)	X	X	X	---	---	---
SC-3A-T01N-GRW (WAT119A)	X	X	X	---	---	---
SC-3B-T01N-GRW (WAT119A)	X	X	X	---	---	---
SC-4A-T01N-GRW (WAT119A)	X	X	X	---	---	---
SC-5A-T01N-GRW (WAT119A)	X	X	X	---	---	---
SC-5B-T01N-GRW (WAT117C)	X	X	X	---	---	---
SC-6A-T01N-GRW (WAT119A)	X	X	X	---	---	---
SC-7A-T01N-GRW (WAT118A)	X	X	X	---	---	---
SC-8A-T01N-GRW (WAT117C)	X	X	X	---	---	---
SPRING13-PUMP-T01N-GRW (WAT116A)	X, MS, LD	X, MS, LD	X, MS, LD	---	---	---
SPRING39-PUMP-T01N-GRW (WAT116A)	X	X	X	---	---	---
TPZ7U-T01N-GRW (WAT120C)	X	X	X	---	---	---
WESTSEEP-T01N-GRW (120C)	X	X	X	X, GRO	X	
Number GW samples	52	52	52	7	8	12
Number MS/MSD or MS/LD	3	3	3	1	1	1
Number Field Duplicates	3	3	3	1	1	1
Number Rinsate Blanks	3	3	3	1	1	1
Number Field Blanks	NA	NA	NA	1	1	1

NA = Not Applicable MS = Matrix Spike LD = Laboratory Duplicate MSD = Matrix Spike Duplicate FD = Field Duplicate
RB = Rinsate Blank FB = Field Blank GRO = Gasoline Range Organics

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

Table 1-2
Summary of Surface Water Samples Collected June 2003

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganics	BOD/COD
DECANT-TO1N-SFW (WAT120C)[2]	---	---	---	---
RR-DS-SPRING13-T01N-SFW (WAT114C)	X, FD	X, FD	X, FD	X, FD
RR-DS-SPRING39-T01N-SFW (WAT114C)	X	X	X	X
RR-US-SPRING13-T01N-SFW (WAT117C)	X, MS, LD	X, MS, LD	X, MS, LD	X, MS, LD
RR-US-SPRING39-T01N-SFW (WAT114C)	X, RB	X, RB	X, RB	X, RB
Number SFW samples	4	4	4	4
Number MS/MSD or MS/LD	1	1	1	1
Number Field Duplicates	1	1	1	1
Number Rinsate Blanks	1	1	1	1

MS = Matrix Spike LD = Laboratory Duplicate FD = Field Duplicate

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.
[2]DECANT sample analyzed for Diesel Range Organics (DRO) only.

The data review process evaluated sample-specific and laboratory performance criteria in accordance with the standard operating procedure (SOP) 12.1. As mentioned in the SOP, all RI/FS data generated for the Questa Mine received an evaluation of sample-specific parameters. In addition, 10% of the data packages (per analysis type per event/episode) were reviewed for laboratory performance parameters. The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Sample-specific reviews evaluated the following sample related parameters:

- Case narrative comments
- Chain-of-Custody/Sample Receipt
- Holding Times
- Method Blank (Preparation Blank)
- Matrix-Dependent Quality Control
  - Matrix Spike Analysis
  - Laboratory duplicate Analysis
- Method-Specific Quality Control Measures
  - Inorganic Method Specific QC Measures

    Post Digestion Spike Analysis

    ICP Serial Dilution Tests

    Internal Standard Performance

    Cation/Anion Balance Evaluation
  - Organic Method Specific QC Measures

    Surrogate Spike Compound Recovery

    Internal Standards
- Total vs Partial Balance
- Field quality control samples
  - Field Duplicate Agreement
  - Rinsate Blank Results
  - Field Blank Results
  - Trip Blank Results

Evaluation of laboratory performance parameters provided an overall representation of the analytical system at the time the samples were analyzed. The laboratory performance review evaluated parameters in control of the laboratory, but independent of the field samples analyzed, as follows:

- Initial Calibration
- Continuing Calibration Verification
- Laboratory Control Sample Analysis
- Compound Identification
- Target Analyte Quantification
- Verification
- Method Specific Quality Control Checks

If any potential systematic problems were determined upon review of the laboratory performance parameters in any of the selected packages evaluated (meeting the 10% criteria), the review parameter was evaluated in all data packages for June 2003 to determine the need for data qualification. Instances, in which professional judgment was exercised in evaluating the need for data qualification, the basis for this rationale was provided in the data review summary.

Upon completion of the sample-specific reviews and laboratory performance reviews, a collective assessment for the event was performed. Site-specific matrix spike, laboratory duplicate, serial dilution, blank (field and rinsate), and field duplicate results were assessed collectively by matrix per event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered more representative of the site sample matrix and a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 3.0 describes sample specific data review findings and several data quality issues affecting all of the water packages. Section 4.0 presents the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Section 5.0 summarizes the collective summary of the field QC results (field and rinsate blanks, when applicable, and field duplicate results) and the resultant sample qualification. Lastly, an overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for data packages WAT113 through WAT121, for a total of nine original data packages. In order to attain the frequency requirements for laboratory performance reviews, a total of one data package (WAT113C) was evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were identified which globally affected all relevant groundwater and surface water samples analyzed for the June 2003 Groundwater and Surface Water sampling event**.** Although most of the issues have been addressed in the individual summary reports, these common issues and conclusions are summarized below.

3.2.1 Holding Blanks

For the analysis of the volatile organic samples, a holding blank was carried through the sample storage period and analyzed in the same sequence as the samples in the data package. As all holding blank recoveries were all nondetect, the indication of the occurrence of potential cross-contamination during sample storage was unlikely.

3.2.2 Manual Integration

Manual integration was employed in deriving results for the volatile and semivolatile organics in a few data packages. The values that were derived from manual integration were qualified on the quantitation reports and extracted ion current profiles were included for each instance. The supporting documentation provided was reviewed and found to be adequate.

3.2.3 Low-level Detections

Detected organic analytes with concentrations between the Method Detection Limit (MDL) and the Reporting Limit (RL) were qualified as estimated (J). A qualifier code of “SQL-I” (Sample Quantitation Limit) was assigned to reflect the greater uncertainty in quantitative values below the RL.

3.2.4 TICS Reported in Blanks

Several Tentatively Identified Compounds (TICs) were reported as present in the semivolatile blanks for each package. The unknown compounds detected in the method blank were qualified as (NJ) to denote the analyses indicated the presence of an analyte that had been “tentatively identified” and the associated numerical value represented its approximate value. However, if similar TICs were present in the associated samples, the results were not considered to be reportable due to laboratory contamination (as indicated by the blank) and therefore, flagged as

unusable (R). After evaluating sample TICs based on laboratory method blanks, any remaining TICs were qualified as "NJ."

3.2.5 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

3.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses:

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilbria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

3.2.7 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked analytes. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.8 Laboratory Performance Review (LPR) Findings

As mentioned previously, one data package was given a full validation to assess the performance of the laboratory for all analyses. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated for all packages for this event included:

- Initial Calibration Verification (ICV) for all metals.

Inorganic parameter matrix QC consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. Organic parameter QC consisted of matrix spike/matrix spike duplicate (MS/MSD) analyses. The site-specific matrix QC results were assessed collectively for the June 2003 Groundwater and Surface Water Sampling Event by matrix (groundwater and surface water) to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.3 present the collective matrix QC results associated with the samples in this event and the resultant data qualifiers.

Three groundwater field samples were designated for both total/dissolved metals, and inorganics matrix spike analyses. One groundwater field sample was designated for volatile, semivolatile, and explosives organics matrix spike analyses. One surface water field sample was designated for total/dissolved, and inorganic matrix spike analyses, as summarized in Table 4-1. Table 4-2 summarizes the breakdown of frequency requirements for each of the analyses per groundwater and surface water for the June 2003 Groundwater and Surface Water Sampling Event.

Table 4-1
Field Samples Designated for Matrix QC Analysis

Sample ID	Analyses					
	Total Metals	Dissolved Metals	Inorganics	VOCs	SVOCs	Explosives
GROUNDWATER						
MMW-28A-T01N-GRW (WAT114C)	X	X	X	X	X	X
MW-1-T01N-GRW (WAT113C)	X	X	X	---	---	---
SPRING13-PUMP-T01N-GRW (WAT116A)	X	X	X	---	---	---
SURFACE WATER						
RR-US-SPRING13-T01N-SFW (WAT117C)	X	X	X	NA	NA	NA

Table 4-2
Frequency Requirements for Matrix QC

Analyses	# MS Samples	Total # Samples	Percentage [1] (%)
GROUNDWATER			
Total Metals	3	52	5.7
Dissolved Metals	3	52	5.7
Inorganics	3	52	5.7
VOC	1	7	14.3
SVOC	1	8	12.5
Explosives	1	12	8.3
SURFACE WATER			
Total Metals	1	4	25
Dissolved Metals	1	4	25
Inorganics	1	4	25
BOD	1	4	25

[1]Frequency percent for organic analyses (VOC, SVOC, and Explosives are based on MS/MSD pairs.

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

4.1 ORGANIC MATRIX SPIKE RESULTS (ACCURACY/PRECISION EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy and precision of the analytical results.

All matrix spike recoveries and RPD values for organics analyses (VOCs, SVOCs, and Explosives were within the historical acceptance range, or otherwise considered an acceptable recovery when historical limits were not available (i.e., between 75-125%), with the exception of PYX. Table 4-3 summarizes the average matrix recoveries for the organic target analytes, along with the laboratory's historical limits and additional action, when warranted.

Table 4-3
Organics Matrix Spike Results

Analyte	Fraction	Historical Laboratory Recovery	Average % Recovery	Additional Action
1,1-Dichloroethene	VOC	61-145	101	None
Benzene	VOC	76-127	106	None
Trichloroethene	VOC	71-120	115	None
Toluene	VOC	76-125	104	None
Chlorobenzene	VOC	75-130	104	None
Phenol	VOC	12-110	75.5	None
2-Chlorophenol	SVOC	27-123	70.5	None
N-Nitroso-di-n-propylamine	SVOC	41-116	88.9	None
4-Chloro-3-methylphenol	SVOC	23-97	76	None
Acenaphthene	SVOC	46-118	76	None
2,4-Dinitrotoluene	SVOC	24-96	77.5	None
4-Nitrophenol	SVOC	10-80	82	None
Pentachlorophenol	SVOC	9-103	75.5	None
Pyrene	SVOC	26-127	83.5	None
HMX	Explosives	83-122	98	None
RDX	Explosives	81-116	95	None
2,4,6-Trinitrotoluene	Explosives	75-106	86.5	None
PETN	Explosives	75-110	82	None
PYX	Explosives	70-130	50	J/UJ MS-L to all samples

With the exception of PYX results, no qualification was necessary for any organic result on the basis of matrix spike recovery. MS/MSD recoveries for PYX were both 50%. Accordingly, all PYX results were qualified as estimated (J/UJ), with a low bias direction assigned.

4.2 INORGANIC MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results.

A number of MS recoveries were outside of the acceptance limits of 75-125% for both inorganics and metals. Tables 4-4 and 4-5 summarize the inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 4-4
Inorganics Matrix Spike Results

Analyte	Number of Valid Spikes/ Total Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
INORGANICS GROUNDWATER					
Chloride	3/3	0	1	117.9	J MS-H to parent sample only
Nitrate	3/3	0	1	115.2	None
Fluoride	3/3	0	0	103.4	None
Ammonia	3/3	2	0	70.2	J/UJ MS-L to all samples
TKN	1/1	0	0	105.0	None
Nitrite	3/3	0	0	111.1	None
Ortho-phosphate	3/3	0	1	113.2	J MS-H to parent sample only
Phosphorus	3/3	2	0	37.4	J/R MS-L to all samples
Sulfate	3/3	3	0	67.9	J/UJ MS-L to all samples
TOC	3/3	0	2	122.4	J MS-H to all samples, or NQ (ND)
Cyanide	3/3	1	0	70.8	UJ MS-L to parent sample only
INORGANICS SURFACE WATER					
Chloride	1/1	0	0	124.8	None
Nitrate	1/1	0	0	104.2	None
Fluoride	1/1	0	0	78.4	None
Ammonia	1/1	0	0	88.0	None
TKN	1/1	0	0	---	None
Nitrite	1/1	0	0	---	None
Ortho-phosphate	1/1	0	0	72.7	None
Phosphorus	1/1	0	0	90.6	None
Sulfate	1/1	0	0	72.8	None
TOC	1/1	1	0	36.0	J/UJ MS-L to all samples
BOD_5	1/1	0	0	100	None
COD	1/1	0	0	97.2	None
Cyanide	1/1	0	0	87.6	None

NQ (ND) = No Qualification for a nondetect with a high bias

Table 4-5
Metals Matrix Spike Results

Analyte	Total				Dissolved				Action
	# Valid	#R <75%	%R > 25%	Avg %R	# Valid	#R <75%	%R > 125%	Avg %R	
METALS GROUNDWATER									
Aluminum	2	0	0	96.1	2	0	0	98.1	None
Antimony	3	0	0	99.6	3	0	0	96.6	None
Arsenic	3	0	0	91.9	2	1	0	85.9	UJ MS-L parent sample only
Barium	3	0	0	99.8	3	0	0	97.6	None
Beryllium	3	0	0	103.7	3	0	0	103.0	None
Boron	3	0	0	103.6	3	0	0	102.0	None
Cadmium	3	0	0	103.0	3	0	0	101.0	None
Chromium	3	0	0	103.1	3	0	0	100.0	None
Cobalt	3	0	0	103.1	3	0	0	101.0	None
Copper	3	0	0	106.4	3	0	0	99.4	None

Analyte	Total				Dissolved				Action
	# Valid	#R <75%	%R > 25%	Avg %R	# Valid	#R <75%	%R > 125%	Avg %R	
Iron	3	0	0	104.4	2	0	0	101.0	None
Lead	3	0	0	107.1	3	0	0	106.0	None
Manganese	2	0	0	99.5	2	0	0	99.7	None
Mercury	3	0	0	104.5	3	0	0	104.0	None
Molybdenum	3	0	0	102.1	3	0	0	100.0	None
Selenium	3	0	0	97.8	3	0	0	95.0	None
Nickel	3	0	0	101.9	3	0	0	98.9	None
Thallium	3	0	0	108.4	3	0	0	106.0	None
Silver	3	0	0	99.4	3	0	0	99.5	None
Vanadium	3	0	0	102.6	3	0	0	102.0	None
Zinc	3	0	0	100.6	3	0	0	93.2	None
METALS SURFACE WATER									
Aluminum	1	0	0	102.0	1	0	0	99.5	None
Antimony	1	0	0	80.2	1	0	0	99.0	None
Arsenic	1	0	0	97.2	1	0	0	94.2	None
Barium	1	0	0	93.3	1	0	0	92.5	None
Beryllium	1	0	0	97.4	1	0	0	96.4	None
Boron	1	0	0	96.4	1	0	0	95.2	None
Cadmium	1	0	0	96.2	1	0	0	97.1	None
Chromium	1	0	0	97.4	1	0	0	96.8	None
Cobalt	1	0	0	96.9	1	0	0	95.8	None
Copper	1	0	0	100.7	1	0	0	98.8	None
Iron	1	0	0	102.7	1	0	0	99.7	None
Lead	1	0	1	138.6	1	0	0	105.1	J MS-H parent sample only
Manganese	1	0	0	96.8	1	0	0	95.7	None
Mercury	1	0	0	102.0	1	0	0	99.1	None
Molybdenum	1	0	0	94.4	1	0	0	93.7	None
Selenium	1	0	0	82.5	1	0	0	79.7	None
Nickel	1	0	0	96.4	1	0	0	94.9	None
Thallium	1	0	0	105.3	1	0	0	105.6	None
Silver	1	0	0	102.5	1	0	0	101.2	None
Vanadium	1	0	0	104.9	1	0	0	101.3	None
Zinc	1	0	0	121.3	1	0	0	95.1	None

Qualifications which resulted are in bold type

In general, qualification was limited to the parent sample if fewer than a quarter of the applicable matrix spike recoveries were outside the acceptance range. Conversely, if more than a quarter of the applicable matrix spike recoveries were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average matrix spike recovery, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

Ammonia, phosphorus, sulfate, and TOC were the only analytes for groundwater for which data qualification was necessary for all event samples. One of three matrix results were recovered outside the acceptance range for chloride, orthophosphate, and cyanide. Due to the limited

frequency and magnitude of the exceedances, data qualification on the basis of MS recoveries was limited to parent samples.

Table 4-4 above also indicates that the accuracy of the analyses relative to the site-specific surface water matrix was acceptable as all average recoveries were within limits, with the exception of TOC. The MS recovery for TOC was 36%, below the lower limit of the acceptance range. Due to the poor recovery of TOC, and considering one result as sufficient to establish a matrix analytical problem for four samples, all TOC sample results were qualified.

As indicated in the table, the accuracy of the analyses relative to the site-specific matrix was acceptable, as all matrix spike recoveries for all metal analytes, with the exception of lead and arsenic reported acceptable recoveries. Both of these analytes were qualified in the parent samples only. In the case of arsenic, the recovery of 73.1% for of the three valid spike results were out. As this recovery was marginally below the lower acceptance limit and the average recovery was well within limits, only the parent sample was qualified. The one recovery for lead for surface waters was above the acceptance range, thereby only necessitating qualification for the parent sample.

4.2.1 Post-Digestion Spikes

Post-digestion spikes were conducted on all ICP and ICP/MS analytes to determine whether matrix recoveries outside of the acceptance range were the result of sample matrix, or due to a bias in the analytical system. All post digestion recoveries for those analytes recovered outside of the acceptance range were reviewed and recovered within the range of 75-125%. Therefore, no qualification of data was assigned for any of the metal analytes on the basis of post-digestion spike recovery, as it was likely that all matrix spike exceedances were due to a matrix effect on digestion rather than a bias in the analytical system.

4.3 INORGANIC LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Laboratory duplicate sample results were evaluated to assess the precision of the laboratory analyses. Three groundwater samples and one surface water sample were designated for metals, dissolved metals, and inorganic parameters laboratory duplicate analysis. The evaluation criteria used are summarized in SOP 12.1. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

The RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within the QAPP acceptance limits for all laboratory duplicate analyses, with the exception of lead, chloride, orthophosphate, and phosphorus results. The parent sample was accordingly qualified as estimated (J), with an indeterminate direction assigned, as summarized in Table 4-6. It was not necessary to assign any global qualifications on the basis of laboratory duplicate results.

Table 4-6
Inorganic Laboratory Duplicate Results

Analyte	#Duplicate Results Exceeding Criteria	Action
INORGANICS		
Lead	1	Parent sample qualified J D-I
Chloride	1	
Orthophosphate	1	
Phosphorus	1	

Based on the LD results, the overall level of precision demonstrated is considered to be acceptable.

4.4 ICP SERIAL DILUTION RESULTS

ICP serial dilutions were performed on metal samples in every data package. These analyses were run on the same samples as were designated for matrix QC analyses, or otherwise randomly selected in data packages in which there were no QC samples designated. These analyses were used to evaluate whether or not significant physical or chemical interferences existed due to sample matrix. This was accomplished by analyzing the sample and a five-fold dilution of the sample. The percent difference (%D) between these two concentrations was compared for those analytes for which the serial dilution analysis was applicable (i.e., the initial concentrations were sufficiently higher (50x) than the IDL, accounting for dilution).

Table 4-7 summarizes each sample utilized for a serial dilution analysis, along with the associated applicable analytes, and the results exceeding the acceptance criterion of ≤10%D.

Table 4-7
ICP Serial Dilution Results

Sample ID	Applicable Analyses (%D>10% in bold)
GROUNDWATER –DISSOLVED FRACTION	
MW-1-D01N-GRW (WAT113C)	Sb, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Mn, Mo, Ni, Tl, Ag, V
MMW-28A-D01N-GRW (WAT114C)	Sb, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Tl, Ag, V
SPRING13PUMP-D01N-GRW (WAT116A)	Al, Cu, Mn, Zn
GROUNDWATER –TOTAL FRACTION	
MW-1-T01N-GRW (WAT113C)	Sb, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Mn, Mo, Ni, Tl, Ag, V
MMW-28A-T01N-GRW (WAT114C)	Sb, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Tl, Ag, V
SPRING13PUMP-T01N-GRW (WAT116A)	Al, **Cu(16.4),** Mn, Zn
CC2A-T01N-GRW (WAT118A)	Ca, Mn, Zn
SC-3A-T01N-GRW (WAT119A)	Al, Ca, Cu, Mn, Zn
EASTSEEP-T01N-GRW (WAT120C)	Cd, Mo,
CABINSPRINGS-T01N-GRW (WAT121C)	Al, **Cd (13.3),** Ca, **Co (12.5),** Cu, Mn, Ni, Zn

Sample ID	Applicable Analyses (%D>10% in bold)
SURFACE WATER DISSOLVED FRACTION	
RR-USSPRING13-D01N-SFW (WAT117C)	**Al (13.0),** Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mn, Mo, Ni, Tl, Ag, V, Zn
SURFACE WATER-TOTAL FRACTION	
RR-USSPRING13-T01N-SFW (WAT117C)	Al, **Sb (10.8),** As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mn, Mo, Ni, Tl, Ag, V, **Zn (16.3)**

Indicates the serial dilution was not applicable to any of the metal analytes.

Table 4-8 summarizes the average % Ds for each of the analytes, broken down into total and dissolved fractions, along with the percent of applicable analytes that exceeded control criteria (10%) for both groundwater and surface water samples, and the resultant qualifiers based on the collective assessment. Where exceedances were identified, the diluted result is generally considered more accurate as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result. Qualifications were generally limited to the parent samples if less than a quarter of the valid serial dilution results were outside of the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set and the magnitude of outages were also taken into consideration. For this event, evaluation of the serial dilution results collectively did not result in any additional qualification of results. The analysis was considered to be in control and did not indicate a pervasive matrix analytical problem.

Table 4-8
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	Avg. %D	%Ds >10%	# of Valid Results	% Valid Results >10%	Avg. %D	%Ds >10%	# of Valid Results	% Valid Results >10%	
GROUNDWATER									
Aluminum	3.5	0	3	0%	1.1	0	0	0%	None
Antimony	3.2	0	2	0%	3.4	0	2	0%	None
Arsenic	---	0	0	---	---	0	0	---	None
Barium	2.9	0	2	0%	2.3	0	2	0%	None
Beryllium	5.8	0	2	0%	5.4	0	2	0%	None
Boron	5.4	0	2	0%	6.1	0	2	0%	None
Cadmium	7.1	1	3	33.3%	5.8	0	2	0%	J DL-L parent sample only
Calcium	1.6	0	4	0%	7.1	0	1	0%	None
Chromium	4.8	0	2	0%	4.4	0	2	0%	None
Cobalt	7.3	1	3	33.3%	4.1	0	2	0%	J DL-L parent sample only
Copper	5.9	1	5	20%	3.2	0	3	0%	J DL-H parent sample only
Iron	---	0	0	---	---	0	2	0%	None
Lead	0.3	0	1	0%	1.3	0	1	0%	None
Magnesium	---	0	0	0%	---	0	0	---	None
Manganese	2.5	0	7	0%	4.4	0	3	0%	None
Molybdenum	4.3	0	3	0%	3.4	0	2	0%	None
Nickel	7.3	0	2	0%	---	0	2	0%	None
Potassium	---	0	0	---	5.8	0	0	---	None

Analyte	Total				Dissolved				Action
	Avg. %D	%Ds >10%	# of Valid Results	% Valid Results >10%	Avg. %D	%Ds >10%	# of Valid Results	% Valid Results >10%	
Selenium	---	0	0	---	---	0	0	---	None
Silver	2.7	0	2	0%	2.5	0	2	---	None
Sodium	---	0	0	---	2.8	0	0	---	None
Thallium	1.2	0	2	0%	---	0	2	0%	None
Vanadium	3.5	0	2	0%	4.2	0	2	0%	None
Zinc	2.9	0	4	0%	0.9	0	1	0%	None
SURFACE WATER									
Aluminum	2.6	0	1	0%	13.0	1	1	100%	J DL-L parent sample only
Antimony	10.8	1	1	100%	7.3	0	1	0%	J DL-L parent sample only
Arsenic	5.4	0	1	0%	5.7	0	1	0%	None
Barium	0.9	0	1	0%	1.7	0	1	0%	None
Beryllium	2.1	0	1	0%	2.7	0	1	0%	None
Boron	2.9	0	1	0%	3.4	0	1	0%	None
Cadmium	5.7	0	1	0%	5.8	0	1	0%	None
Calcium	1.2	0	1	0%	2.7	0	1	0%	None
Chromium	1.2	0	1	0%	1.6	0	1	0%	None
Cobalt	1.2	0	1	0%	1.8	0	1	0%	None
Copper	2.8	0	1	0%	0.9	0	1	0%	None
Iron	0.5	0	1	0%	8.4	0	1	0%	None
Lead	1.0	0	1	0%	0.1	0	1	0%	None
Magnesium	---	0	0	---	---	0	0	---	None
Manganese	1.0	0	1	0%	1.9	0	1	0%	None
Molybdenum	1.2	0	1	0%	2.5	0	1	0%	None
Nickel	1.3	0	1	0%	2.2	0	1	0%	None
Potassium	---	0	0	---	---	0	0	---	None
Selenium	---	0	0	---	---	0	0	---	None
Silver	4.9	0	1	0%	5.2	0	1	0%	None
Sodium	---	0	0	---	---	0	0	---	None
Thallium	1.4	0	1	0%	0.6	0	1	0%	None
Vanadium	0.6	0	1	0%	0.8	0	1	0%	None
Zinc	16.3	1	1	100%	4.0	0	1	0%	J DL-H parent sample only

As is evident from the table above, six serial dilution results were in excess of 10% (three for both groundwater and surface water). Only the parent samples were qualified. For the three groundwater exceedances (cadmium, cobalt, and copper), the average %Ds were below 10%, with only one out of a minimum of three applicable results out. For the three surface water exceedances (aluminum, antimony, and zinc), only one serial dilution result was valid, and although out, did not result in global qualification. There was no indication of a matrix analytical problem related to serial dilutions for metal analyses.

Site-specific field duplicate samples, rinsate blanks, and field blanks were assessed collectively by matrix for the June 2003 Groundwater and Surface Water Sampling Event to determine the need for qualification of sample results of similar matrices. The sections to follow summarize the results for these QC samples and any collective qualifications arising from the assessments.

5.1 FIELD DUPLICATE AGREEMENT

The field duplicate agreement assessment evaluated the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, as follows. When both concentration results were sufficiently greater (5x) the RL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤30%. If one or both of the concentration results were less than 5x the RL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤2x the RL. Again, the frequency of the field duplicate samples followed the frequency of matrix spike and laboratory duplicate analyses, as the same samples were designated for all QC parameters. Table 5-1 summarizes the sample sites, which were duplicated and notated as field duplicate samples, per parameter. The breakdown of field duplicate pair samples per analysis and fraction can be referenced in Table 5-2.

Table 5-1
Summary of Field Duplicate Samples Collected June 2003

Sample ID	Analyses						
	Total Metals	Dissolved Metals	Inorganics	VOCs	SVOCs	Explosives	BOD
MMW-45A-T01N/T01D-GRW (WAT115A)	X	X	X	---	---	---	NA
MMW-47A-T01N/T01D-GRW(WAT115A)	X	X	X	X	X	X	NA
MW-23-T01N/T01D-GRW (WAT117C)	X	X	X	---	---	---	NA
RR-DS-SPRING13-T01N-GRW (WAT114C)	X	X	X	---	---	---	X

Table 5-2
Field Duplicate Collection Frequency for the June, 2003 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	3	52	5.7
Dissolved Metals	3	52	5.7
Inorganics	3	52	5.7
VOC	1	7	14.3
SVOC	1	8	12.5
Explosives	1	12	8.3
SURFACE WATER			
Total Metals	1	4	25.0
Dissolved Metals	1	4	25.0
BOD/COD	1	4	25.0

All field duplicate samples assessed for the June 2003 Groundwater and Surface Water Sampling event were within the criteria specified in SOP 12.1. As such, it was not necessary to qualify any results in this event for field duplicate imbalances. Based on the FD results, the overall level of precision demonstrated is considered to be acceptable.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blank samples were prepared by pouring ASTM type II water/laboratory supplied "reagent-free" water over decontaminated sampling equipment and collecting the water in the appropriate sampling containers. Table 5-3 summarizes the rinsate blank samples associated with the samples collected during the June Groundwater and Surface water sampling event. The QAPP required frequency of 5% for the collection of rinsate blanks was met for the June 2003 sampling event.

Table 5-3
Summary of Rinsate Blank Samples Collected June 2003

Sample ID	Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives	BOD/COD
GROUNDWATER –TOTAL FRACTION						
RB01T-GRW (WAT114C)	X	X	X	X	X	NA
RB02T-GRW (WAT114C)	X	X	---	---	---	NA
RB03T-GW (WAT113C)	X	X	---	---	---	NA
Frequency:	5.7%	5.7%	14.3%	12.5%	8.3%	---
SURFACE WATER –TOTAL FRACTION						
RB01T-SFW (114C)	X	X	NA	NA	NA	X
Frequency:	25%	25%	---	---	---	25%

Table 5-4 summarizes the analytes detected in the associated RI/FS rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 5-4
Summary of Rinsate Blank Results and Additional Qualifications

Analytes	RL	# of Detections	Total # of Rinsate Blanks	% Detections	Average Conc. (mg/L)	x5 Criteria (mg/L)	Range for Field Samples (mg/L)	Action
GROUNDWATER- TOTAL FRACTION								
Ammonia	0.04	1	3	33.3	0.06	0.3	0.04-0.34	Detected ammonia results ≤0.3→U RB-I
Beryllium	0.3	1	3	33.3	0.3	1.5	0.2-103	Detected beryllium results ≤1.5→U RB-I
Total Alkalinity	1.0	3	3	100	2.7	13.8	1-476	Detected total alk. results ≤13.8→U RB-I
Bicarbonate Alkalinity	1.0	3	3	100	2.7	13.8	1-476	Detected bicarbonate results ≤13.8→U RB-I

Analytes	RL	# of Detections	Total # of Rinsate Blanks	% Detections	Average Conc. (mg/L)	x5 Criteria (mg/L)	Range for Field Samples (mg/L)	Action
Cadmium	0.5	1	3	33.3	0.5	2.5	0.5-70 (ug/L)	Detected cadmium results ≤2.5→U RB-I
Chloride	0.4	3	3	100	8.1	40.5	0.4-163	Detected chloride results ≤40.5→U RB-I
Chloroform	10	1	3	33.3	2.0	10	10-10 (ug/L)	Detected chloroform results ≤10→U RB-I
Chromium	1.0	1	3	33.3	2.8	14	0.6-221 (ug/L)	Detected chromium results ≤14→U RB-I
Lead	0.2	1	3	33.3	0.17	0.85	0.2-198 (ug/L)	Detected lead results ≤0.85→U RB-I
Mercury	0.1	2	3	66.7	0.1	0.5	0.1-0.26 (ug/L)	Detected mercury results ≤0.5→U RB-I
TDS	10	3	3	100	40	200	88-4910	Detected TDS results ≤200→U RB-I
TSS	0.5	1	3	33.3	0.63	3.15	0.5-159	Detected TSS results ≤3.15→U RB-I
SURFACE WATER- TOTAL FRACTION								
Aluminum	50.3	1	1	100	83.6	418	761-1130 (ug/L)	None
Ammonia	0.04	1	1	100	0.1	0.5	0.053-0.068	Detected ammonia results ≤0.5→U RB-I
Bicarbonate Alkalinity	1.0	1	1	100	2.8	14	54.1-57.8	Detected bicarbonate results ≤14→U RB-I
Total Alkalinity	1.0	1	1	100	2.8	14	54.1-57.8	Detected total alk. results ≤14→U RB-I
Chloride	0.2	1	1	100	0.4	2.0	1.7-10.6	Detected chloride results ≤2.0→U RB-I
Chromium	1.0	1	1	100	1.1	5.5	1-2.1 (ug/L)	Detected chromium results ≤5.5→U RB-I
Fluoride	0.1	1	1	100	0.35	1.8	0.31-1.3	Detected fluoride results ≤1.8→U RB-I
Lead	0.1	1	1	100	0.1	0.5	1.4-4.7 (ug/L)	Detected lead results ≤0.5→U RB-I
Manganese	1.0	1	1	100	1.4	7.0	108-140 (ug/L)	None
TDS	10	1	1	100	32	160	100-160	Detected TDS results ≤160→U RB-I
Zinc	1.4	1	1	100	6.4	32	51.2-58.9 (ug/L)	Detected zinc results ≤32→U RB-I

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results less than the calculated criteria concentration. In determining the average concentrations, one half the RL was used for nondetect values to represent the contributing concentration, as opposed to zero, which could potentially bias the average concentration low. Despite the fact that some results were qualified as nondetect on the basis of rinsate blank detections, the rinsate blank results are generally indicative of acceptable decontamination procedures as detections were infrequent and at low levels.

5.3 FIELD BLANK RESULTS

The analyses of organic parameters require field blanks to assure appropriate quality control. The field blank results are utilized to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Table 5-5 summarizes the field blank samples that were collected with the organic samples in this data package. The required QC frequency of 5% was attained.

Table 5-5
Summary of Field Blank Samples Collected June 2003

Sample ID	Volatile Organics	Semivolatile Organics	Explosives
GROUNDWATER –TOTAL FRACTION			
FB01T-GRW (WAT113C)	X	X	X
Frequency:	14.3%	12.5%	8.3%

No compounds were recovered in the field blank associated with the data in this package. As such, no qualification was necessary on the basis of field blank contamination. The field blank results indicate that no contamination of field samples were due to ambient field conditions.

5.4 TRIP BLANK RESULTS

A trip blank accompanied each cooler of VOC samples to the sampling site. It was handled like an environmental sample and returned to the laboratory for VOC analysis. Trip blank results were used to assess the potential introduction of contaminants from sample containers or during the transportation/storage procedures. All trip blank samples associated with the volatile organic samples in the June 2003 sampling event were nondetect.

All data were considered acceptable for use in meeting project objectives as qualified. Multiple sample results were qualified as nondetect on the basis of contamination identified in the laboratory blank or rinsate blank. Others were qualified as estimated on the basis of matrix spike, LCS, or surrogate recoveries. Lastly, several data results were qualified as estimated on the basis of holding time exceedances, serial dilution results, laboratory/field duplicate disagreements, total vs. partial disagreements, anion/cation imbalances, or calibration results (for organics). These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment for June 2003

Analysis Type	QC Measure	# of Analytes Measured	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	FD	33	33	100
	LD	33	33	100
Total Metals	FD	66	66	100
	LD	66	66	100
Dissloved Metals	FD	63	63	100
	LD	63	63	100
Volatile Organics	FD	43	43	100
	MSD	5	5	100
Semivolatile Organcis	FD	62	62	100
	MSD	6	6	100
Explosives	FD	5	5	100
	MSD	5	4	80
SURFACE WATER				
Inorganics	FD	11	11	100
	LD	11	7	64
Total Metals	FD	22	22	100
	LD	22	22	100
Dissolved Metals	FD	21	21	100
	LD	21	21	100
BOD_5/COD	FD	1	1	100
	LD	1	1	100

The percentage of acceptable precision measurements was 100% for all parameters, with the exception of explosives for groundwater and inorganics for surface water, for which 80% and

64% of the duplicate analyses were within acceptable limits, respectively. The overall level of precision demonstrated for all analyses collectively was considered to be acceptable.

6.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Percent of MS (and MSD) recoveries meeting criteria are summarized in Table 6-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters. The only analyte, which was systematically reviewed and accordingly qualified on the basis of low LCS recoveries, was PYX. Of the data packages comprising the June 2003 Groundwater and Surface Water Sampling Event, 100% of the PYX results were qualified as estimated (J/UJ) with a low bias direction.

Table 6-2
Summary of Accuracy Assessment for June 2003

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	MS	41	26	63.4
Metals	MS	123	121	98.4
Volatile Organics	MS/MSD	10	10	100
Semivolatile Organics	MS/MSD	18	18	100
Explosives	MS/MSD	10	8	80.0
SURFACE WATER				
Inorganics	MS	11	10	90.9
Metals	MS	43	42	97.7

The percentage of acceptable accuracy measurements ranged from 63-100%. Consequently, ammonia, phosphorus, sulfate, TOC, and PYX for groundwaters, TOC for surface waters were globally qualified for samples in this event. The overall level of accuracy with respect to the site matrix demonstrated for all analyses collectively was considered to be generally acceptable.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results were considered usable as qualified for meeting project objectives. As such, a percentage of 100% was calculated to represent the completeness of ground water samples and 100% for surface water samples, both of which satisfied the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the groundwater and surface water samples collected during the June 2003 sampling event. As no data were qualified on the basis of field duplicate disagreement, this was an indication that the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 5.2 indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analytes. Where possible, the laboratory submitted data from lesser dilutions (for organic analyses), thereby achieving detection limits for non-detects, as specified in the QAPP. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. While it is anticipated that all non-rejected data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT113C

Sampling Event: June 2003 GRW/SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter

Date Completed: 09/15/03

Peer Reviewer: Karen Kronoveter

Date Completed: 09/16/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	pH	Conductivity
MW-1-T01N-GRW	SA	529141		W	X	X				X	X
MW-1-D01N-GRW	SA	529142		W	X						
MW-21-T01N-GRW	SA	529143		W	X	X				X	X
MW-21-D01N-GRW	SA	529144		W	X						
MW-24-T01N-GRW	SA	529145		W	X	X				X	X
MW-24-D01N-GRW	SA	529146		W	X						
MW-17-T01N-GRW	SA	529147		W	X	X	X	X		X	X
MW-17-D01N-GRW	SA	529148		W	X						
MMW-44B-T01N-GRW	SA	529149	MW44BT01NGRW	W	X	X	X	X	X	X	X
MMW-44B-D01N-GRW	SA	529150		W	X						
MMW-42B-T01N-GRW	SA	529151		W	X	X				X	X
MMW-42B-D01N-GRW	SA	529152		W	X						
RB03T-GRW	RB	529153		W	X	X				X	X
FB01T-GRW	FB	529154		W	X		X	X	X		
TB202-GRW	TB	529155		W			X				
TB217-GRW	TB	529156		W			X				

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The nitroaromatic analysis of the blank spike samples B2LCS yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded a recovery of 58% (in the duplicate LCS

as well). The laboratory has not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples were qualified as estimated (UJ) with a low bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, samples MMW-44B-T01N-GRW and MMW-42B-T01N-GRW for cyanide analysis were received at a pH below 12. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect cyanide results for these samples were qualified as estimated (UJ), with an indeterminate bias direction.
Holding Times	No	As stated in the laboratory case narrative, the Total Suspended Solids (TSS) analysis for sample RB03T-GRW was accomplished 8 days beyond the prescribed analytical holding time of 7 days due a sample management error at the laboratory. The nature of this issue was not apparent from the summary or extended data package. Accordingly the nondetect TSS result for this rinsate blank was qualified as estimated (UJ). The 48-hour holding times for nitrate, nitrite, and orthophosphate were exceeded by several hours for the majority of samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken nine days after sampling and seven days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2a summarizes the blank detections and the resultant data qualifications. One volatile blank was associated with the analysis of the volatile data in this package. 1,2,4-Trichlorobenzene was detected in VBLKJ1 (analyzed on 06/05/03) at a concentration of 1.0 µg/L. As 1,2,4-Trichlorobenzene was not present in any of the samples analyzed for volatiles in this data package, qualification was not necessary on the basis of method blank detections. Two semivolatile blanks were associated with the semivolatile data analyzed in this data package. Bis (2-Ethylhexyl) phthalate was detected in SBLKY7 (analyzed on 06/12/03) at a concentration of 0.7 µg/L. This analyte was detected in field blank sample FB01T-GRW at a concentration of 1.0 mg/L and was therefore qualified as nondetect (U) with an indeterminate bias direction assigned.
Matrix QC • MS/MSD MW-1-T01N-GRW MW-1-D01N-GRW • PDS MW-1-T01N-GRW MW-1-D01N-GRW • LD MW-1-T01N-GRW MW-1-D01N-GRW		Several inorganic analytes were recovered outside the acceptable range of 75-125% for the matrix analysis of sample MW-1-T01N-GRW. Table 1.3 summarizes analytes detected outside this range, along with qualification codes of the parent sample. The matrix quality control results for the June 2003 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (C) MW-1-T01N-GRW MW-1-D01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	Two serial dilution tests were conducted and presented with this data package. The serial dilution results could not be used to assess potential interferences for nine of the 24 metals analyzed by ICP since only 15 analytes had initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. The %D for cadmium in sample MW-1-T01N-GRW was 10.3%. Because 10.3% rounds to 10%, it was not considered necessary to qualify the cadmium result for the parent sample based on serial dilution. The serial dilution results for the June 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5. The phosphorus and orthophosphate results for samples MMW-42B-T01N-GRW and MMW-44B-T01N-GRW were qualified as estimated (J/UJ TVP-I) because the orthophosphate results were greater than the phosphorus results.
Field QC • Field Duplicate • Rinsate Blank RB03T-GRW • Field Blank FB01T-GRW • Trip Blank TB202-GRW TB217-GRW	Yes	No target analytes were detected in either trip blank sample. As such, the possibility of cross-contamination occurring during sample shipment is unlikely. The field QC results for the June 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	NA	

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	As none of the Initial calibration checks for VOCs/SVOCs reported analytes outside acceptance criteria, no qualification was necessary.
Initial/Continuing Calibration Verification	No	Table 1.4 summarizes the continuing calibration results outside the evaluation criteria and any resultant data qualification issues for SVOCs only.
Laboratory Control Sample Results	No	Results for PYX were qualified as estimated (UJ) on the basis of low LCS recoveries, as mentioned in the case narrative section of this report. Additionally, the laboratory performance review revealed an LCS recovery for 4-Nitrophenol of 83%, outside the historical acceptance range of 10-80%. No qualification of data was necessary, as all results for this target analyte were nondetect. In addition, an 83% recovery is considered acceptable for accuracy analysis despite the fact that it is outside of the laboratory's historical range.
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)	Conductivity (µmhos/cm)	pH (std. units)	TSS (mg/L)
MW-1-T01N-GRW	1.0 J	0.0050 UJ	0.060 J	1280 J	7.3 J	---
MW-21-T01N-GRW	---	0.014 J	0.068 J	1150 J	7.5 J	---
MW-24-T01N-GRW	---	0.0050 UJ	0.051 J	370 J	7.3 J	---
MW-17-T01N-GRW	---	0.0050 UJ	0.068 J	679 J	7.5 J	---
MMW-44B-T01N-GRW	---	---	0.078 J	2800 J	6.7 J	---
MMW-42B-T01N-GRW	---	0.0050 UJ	0.16 J	2830 J	7.1 J	---
RB03T-GRW	---	0.0050 UJ	0.010 UJ	1.7 J	7.1 J	0.50 UJ

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS) Run 2	---	---	---	---	---	1.931	0.50	MW-1-T01N-GRW	U MB-I
Arsenic (MS) Run 2	---	---	---	---	---	-0.573	0.20	MW-1-D01N-GRW MW-1-T01N-GRW	UJ MB-L
Cadmium (P) Run 1/Run 2	---	0.7/ 0.5	---	0.6	---	0.543/ 0.504	0.50	MW-17-D01N-GRW MW-17-T01N-GRW MW-1-T01N-GRW MW-21-D01N-GRW MW-24-T01N-GRW	U MB,CCB-I
Lead (MS) Run 1/Run 2	---	---	---	---	---	0.299/ 1.495	0.10	All samples	U MB-I
Molybdenum (P) Run 1/Run 2	---	---/ 5.3	2.6/ 3.0	---	---	---	2.3/ 2.3	MMW-42B-D01N-GRW MMW-44B-D01N-GRW MMW-44B-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW MW-24-D01N-GRW MW-24-T01N-GRW	U CCB-I
Silver (MS) Run 2	0.6	0.8	1.0	1.1	1.2	-0.206	0.10	MW-1-D01N-GRW MW-1-T01N-GRW	UJ MB,CCB-L UJ MB-L

MS = ICP-MS P = ICP CCBx = Continuing Calibration Blank RL = Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Inorganic and Metals Matrix Spike Results and Parent Sample Qualifications

Analyte	% MS	PDS %R	Criteria	RL* (mg/L)	Comment	Action
MW-1-T01N-GRW						
Chloride	156.5	N/A	75-125%	0.2 mg/L	Qualification was limited to the parent sample at the time of sample specific review.	J MS-H
Ammonia-Nitrogen	65.0	N/A		0.040 mg/L		UJ MS-L
Phosphorus	3.0	N/A		0.010 mg/L		J MS-L
Sulfate	60.6	N/A		5.0 mg/L		J MS-L
Total Organic Carbon	141.6	N/A		1.0 mg/L		J MS-H

Table 1.4
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	%D >25%	Action	Qualification and Qualification Codes
SVOC	06/12/03 (1644)	4-Nitroaniline	35.4	MW-17-T01N-GRW	UJ CCAL-I
SVOC	06/16/03 (1353)	Benzaldehyde	-39.2	FB01T-GRW MMW-44B-T01N-GRW	UJ CCAL-I

CCAL = Continuing Calibration %D = Percent difference between the initial and continuing calibration RRFs

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT114C

Sampling Event: June 2003 GRW/SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 10/16/03

Peer Reviewer: Stacey Coker

Date Completed: 02/01/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses						
					Metals	Inorganics	VOCs	SVOCs	Explosives	BOD	COD
MW-9A-T01N-GRW	SA	529298		W	X	X					
MW-9A-D01N-GRW	SA	529299		W	X						
MW-20-T01N-GRW	SA	529300		W	X	X					
MW-20-D01N-GRW	SA	529301		W	X						
RB02T-GRW	RB	529302		W	X						
RB01T-GRW	RB	529303		W	X	X	X	X	X		
RR-DS-SPRING13-T01N-SFW	SA	529439	RR-DS-SPRG13-T01N-SF	W	X	X				X	X
RR-DS-SPRING13-D01N-SFW	SA	529440	RR-DS-SPRG13-D01N-SF	W	X						
RR-DS-SPRING13-T01D-SFW	FD	529441	RR-DS-SPRG13-T01D-SF	W	X	X				X	X
RR-DS-SPRING13-D01D-SFW	FD	529442	RR-DS-SPRG13-D01D-SF	W	X						
RR-DS-SPRING39-T01N-SFW	SA	529443	RR-DS-SPRG39-T01N-SF	W	X	X				X	X
RR-DS-SPRING39-D01N-SFW	SA	529444	RR-DS-SPRG39-D01N-SF	W	X						
RR-US-SPRING39-T01N-SFW	SA	529445	RR-US-SPRG39-T01N-SF	W	X	X				X	X
RR-US-SPRING39-D01N-SFW	SA	529446	RR-US-SPRG39-D01N-SF	W	X						
ELEROCKCGWELL1-T01N-GRW[4]	SA	529447	EROCKCGWELL1-T01N-G	W	X	X					
ELEROCKCGWELL1-D01N-GRW[4]	SA	529448	EROCKCGWELL1-D01N-G	W	X						
COLCG1-T01N-GRW	SA	529449		W	X	X			X		
COLCG1-D01N-GRW	SA	529450		W	X						
MMW-28A-T01N-GRW	SA	529451	28AT1NGRW	W	X	X	X	X	X		
MMW-28A-D01N-GRW	SA	529452		W	X						
RB01T-SFW	RB	529453		W	X	X				X	X
TB201-GRW	TB	529454		W			X				

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

(1) The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
(2) Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered by the review table below, were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The laboratory case narrative noted the replicate analysis of sample MMW-28A-T01N-GRW resulted in a Relative Percent Difference (RPD) for TOC that was in excess of control criteria. Upon review of the summary forms, it was determined that no qualification was necessary on the basis of laboratory duplicate results due to the fact that the RPD was not the appropriate evaluation criteria for the analyte in question (TOC) (i.e. neither result was greater than 5x the RL, therefore the absolute difference between the two results was compared to an evaluation criteria of ≤1x RL).

As noted in the laboratory case narrative, the metals analysis of the serial dilution associated with sample MMW-28A-T01N-GRW reported a percent difference for aluminum in excess of 10%. However, upon review of the data, and considering a 10-fold dilution, aluminum was determined not applicable to the serial dilution analysis, as the initial sample result was less than 50 x IDL, adjusted for dilution. No qualification was necessary on the basis of serial dilution results.

The laboratory case narrative noted the semivolatile organics analyses of the blank spike samples associated with this delivery group exhibited generally acceptable recoveries with select exceptions exceeding control criteria. It was determined that all target analytes were recovered within the acceptance range for each compound. It was concluded, therefore, that this statement made by the laboratory was erroneous. No qualification of semivolatile organic data was necessary on the basis of LCS recoveries.

The nitroaromatic analysis of the blank spike samples B2LCS and B8LCS yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded recoveries of 58% and 60%, respectively. The laboratory has not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples were qualified as estimated (UJ) with a low bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory log-in sheet noted that sample RB02T-GRW was not marked on the COC for the inorganic aqueous suite of analyses, however the proper volume was received and was this sample was therefore analyzed for inorganics and metals. Upon sample receipt and log-in, it was noted that sample RR-DS-SPRING39-T01N-GRW was listed incorrectly on the chain of custody as a ground water sample. The correct sample ID is RR-DS-SPRING39-T01N-SFW. The laboratory logged the sample in according to the field ID on the labels, which correctly identified the sample as a surface water sample. No data qualification was necessary and completeness was not affected by these inadvertent errors on the COC form.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Holding Times	No	As stated in the laboratory case narrative, the Total Suspended Solids (TSS) analysis for sample ELEROCKWELL1-T01N-GRW was accomplished 10 days beyond the prescribed analytical holding time of 7 days due a sample management error at the laboratory. The nature of this issue was not apparent from the summary or extended data package. Accordingly, the detected TSS result for this sample was qualified as estimated (J). The 48-hour holding times for nitrate, nitrite, orthophosphate, and BOD_5 were exceeded by several hours for the majority of the SFW samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken five or six days after sampling. The pH for all samples was measured approximately 6 to 7 1/2 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.
Matrix QC • MS/MSD • PDS • LD		Several inorganic, semivolatile, and explosives analytes were recovered outside the acceptable range of 75-125% for the matrix analysis of sample MMW-28A-T01N-GRW. Table 1.3 summarizes analytes recovered outside this range, along with qualification codes assigned to the parent sample. The matrix quality control results for the June 2003 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MMW-28A-T01N-GRW MMW-28A-D01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	Serial dilution tests were conducted on two samples, MMW-28A-T01N-GRW and MMW-28A-D01N-GRW. The serial dilution results could not be used to assess potential interferences for 9 of the 24 metals analyzed by ICP since 15 analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. As none of the %Ds exceeded 10%, no qualification on the basis of serial dilution was necessary. Three sets of sample results were qualified on the basis of partial vs total disagreements. Table 1.4 summarizes these samples, along with the reported concentrations and qualifications assigned. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The laboratory case narrative noted the ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5. However, this comment was erroneous, as sample COLCG1-T/D01N-GRW reported a TDS ratio of 1.66. Due to the fact that the TDS calculated was greater than the TDS measured and the cation/anion balance was within the acceptance criteria, the measured TDS results for this sample was qualified as estimated (J) with a low bias direction and qualifier code of "TvP".

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate RR-DS-SPRING13-T01N/T01D-GRW RR-DS-SPRING13-D01N/D10D-GRW • Rinse Blank RB02T-GRW RB01T-GRW RB01T-SFW • Field Blank • Trip Blank TB201-GRW	Yes	Evaluation of field duplicate agreement for both pairs of field duplicate samples met the criteria in the QAPP and therefore did not require qualification. Several analytes were detected in the rinsate blank samples analyzed in this data package. The need to qualify data on the basis of rinsate blank detection will be determined in the collective assessment and accordingly qualified at this time, The field QC results for the June 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial Calibration • VOCs/SVOCs: Continuing Calibration • Metals: Interference Check Sample Results As none of the initial calibration checks for VOCs/SVOCs reported analytes outside acceptance criteria, no qualification was necessary. Table 1.5 summarizes the continuing calibration results outside the evaluation criteria and any resultant data qualification issues for VOCs and SVOCs. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-phosphate	BOD_5	Conductivity	pH	TDS	TSS
MW-9A-T01N-GRW	0.56 J	0.0050 UJ	0.087 J	---	1320 J	7.2 J	---	---
MW-20-T01N-GRW	1.9 J	0.0050 UJ	0.083 J	---	441 J	7.3 J	---	---
RB02T-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	---	0.34 J	6.1 J	---	---
RB01T-GRW	---	---	---	---	0.00 J	5.3 J	---	---
RR-DS-SPRG13-T01N-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	1.5 UJ	189 J	7.7 J	---	---
RR-DS-SPRG13-T01D-SFW	0.40 UJ	0.0050 UJ	0.021 J	1.5 UJ	187 J	7.7 J	---	---
RR-DS-SPRG39-T01N-SFW	0.40 UJ	0.0050 UJ	0.024 J	1.5 UJ	190 J	7.5 J	---	---
RR-US-SPRG39-T01N-SFW	0.40 UJ	0.0050 UJ	0.021 J	1.5 UJ	180 J	7.4 J	---	---
ELEROCKCGWELL1-T01N-GRW	---	---	---	---	267 J	6.9 J	638 J	0.70 UJ
COLCG1-T01N-GRW	---	---	---	---	154 J	7.3 J	---	---
MMW-28A-T01N-GRW	0.55 J	0.0050 UJ	0.072 J	---	864 J	6.3 J	---	---
RB01T-SFW	0.40 UJ	0.0050 UJ	0.010 UJ	1.5 UJ	0.11 J	6.0 J	---	---

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P)	---	0.3	0.3	0.5	0.6	5.6	---	0.30	MMW-28A-T01N-GRW RB01T-GRW RR-DS-SPRING13-D01D-GRW RR-US-SPRING39-T01N-GRW	U CCB-I
Cadmium (P)							0.584	0.50	COLCG-D01N-GRW COLCG-T01N-GRW ELEROCKCGWELL1-D01N-GRW ELEROCKCGWELL1-T01N-GRW MMW-28A-D01N-GRW MMW-28A-T01N-GRW RB01T-GRW RB02T-GRW	U MB-I
Copper (P)	---	---	---	-2.3	-2.7	-9.1	---	1.50	RB01T-GRW RB02T-GRW	UJ CCB-L
Iron (P)	---	---	39.1	---	39.7	---	---	31.1	RR-US-SPRING39-D01N-SFW	U CCB-I
Silver (MS)	0.1	0.2	0.2	0.2	0.2	---	0.545	0.1	RR-DS-SPRING13-D01D-SFW RR-DS-SPRING13-D01N-SFW RR-DS-SPRING13-T01D-SFW RR-DS-SPRING13-T01N-SFW RR-DS-SPRING39-D01N-SFW RR-DS-SPRING39-T01N-SFW RR-US-SPRING39-D01N-SFW RR-US-SPRING39-T01N-SFW ELEROCKCGWELL1-T01N-GRW ELEROCKCGWELL1-D01N-GRW	U MB,CCB-I U MB-I

MS=ICP-MSP=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results And Parent Sample Qualifications

Analyte	% MS	PDS %R	Criteria	RL* (mg/L)	Comment	Action
MMW-28A-T01N-GRW						
Ammonia-Nitrogen	68.8	N/A	75-125%	0.040	Qualification was limited to the parent sample at the time of sample specific review.	J MS-L
Sulfate	68.8	N/A		5.0		J MS-L
4-Nitrophenol	84.0	N/A	10-80%	25 (µg/L)	Nondetect result, with a high bias	NQ
PYX	50	50 (MSD)	70-130%	0.25 (µg/L)	Qualification was limited to the parent sample at the time of sample specific review.	UJ MS-L

Table 1.4
Total vs. Partial Concentrations Resulting in Qualification

Sample	Total Phosphorus (mg/L)	Orthophosphate (mg/L)	Qualification Code
MW-9A-T01N-GRW	0.010 U	0.087 J	UJ/J TvP-I
ELEROCKCGWELL1-T01N-GRW	0.010 U	0.036 J	UJ/J TvP-I
MMW-28A-T01N-GWR	0.010 U	0.072 J	UJ/J TvP-I

Table 1.5
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

Analysis	ICAL Date/Time	Analyte	% D >25%	Action	Qualification and Qualification Codes
VOC	06/05/03 (2101)	Acetone	28.4	Results for these analytes in associated samples were qualified as estimated	UJ CCAL-I
		2-Butanone	25.2		
SVOC	06/12/03 (1644)	4-Nitroaniline	35.4		
	06/16/03 (1353)	Benzaldehyde	-39.2		

CCAL = Continuing Calibration %D = Percent difference between the initial and continuing calibration RRFs

[NO FILE SUBMITTED]

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT116A

Sampling Event: June 2003 GRW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 09/10/03

Peer Reviewer: Stacey Coker

Date Completed: 09/14/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Metals	Inorganics	Explosives	VOCs	SVOCs
SC-1A-T01N-GRW	SA	529393		W	X	X[3]			
SC-1A-D01N-GRW	SA	529394		W	X				
SC-1B -T01N-GRW	SA	529395		W	X	X[3]			
SC-1B -D01N-GRW	SA	529396		W	X				
MMW-45B-T01N-GRW	SA	529397		W	X	X			
MMW-45B-D01N-GRW	SA	529398		W	X				
MMW-10A-T01N-GRW	SA	529498	MW10AT01NGRW	W	X	X	X		
MMW-10A-D01N-GRW	SA	529499		W	X				
MMW-29A-T01N-GRW	SA	529500	MW29AT01NGRW	W	X	X	X		
MMW-29A-D01N-GRW	SA	529501		W	X				
MMW-44A-T01N-GRW	SA	529502	MMW-44A-GRW or MW44AT01NGRW	W	X	X	X	X	X
MMW-44A-D01N-GRW	SA	529503		W	X				
MMW-33A-T01N-GRW	SA	529504	MW33AT01NGRW	W	X	X			
MMW-33A-D01N-GRW	SA	529505		W	X				
MMW-33A-T01N-GRW	SA	529512		W			X		
SPRING39PUMP-T01N-GRW	SA	529506	SPRING39PUMP-T01N-GR	W	X	X			
SPRING39PUMP-D01N-GRW	SA	529507	SPRING39PUMP-D01N-G	W	X				
GWW-3-T01N-GRW	SA	529508		W	X	X			
GWW-3-D01N-GRW	SA	529509		W	X				
SPRING13PUMP-T01N-GRW	SA	529510	SPRING13PUMP-T01N-GR SPG13PUMP-T01N-GRWA SPG13PUMP-T01N-GRWS SPG13PUMP-T01N-GRWD SPG13PUMP-T01N-GRWR SPG13PUMP-T01N-GRW SPG13PUMP-T01N-GRWSL	W	X	X			

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Metals	Inorganics	Explosives	VOCs	SVOCs
SPRING13PUMP-D01N-GRW	SA	529511	SPRING13PUMPD01N-G SPG13PUMP-D01N-GRWA SPG13PUMP-D01N-GRWS SPG13PUMP-D01N-GRWD SPG13PUMP-d01N-GRWSL	W	X				
TB211-GRW	TB	529513		W				X	

Matrix: W = Water
QC Type: SA = Sample TB = Trip Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.
[3]Received split from USGS. As such, suite of inorganics is limited due to volume provided.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The ratios of calculated versus measured total dissolved solids (TDS) were within the validation limits. However, TDS measurements for SC-1A-T01N-GRW and SC-1B-T01N-GRW were not possible due to reduced volume provided to the laboratory. Both samples were split samples collected by USGS employees. URS was provided with a sample volume comparable to what USGS was collecting for their sampling program. As such, the inorganic bottles provided only covered a limited number of the RI/FS inorganics.

The laboratory noted that the metals analyses of the samples in this delivery group were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by field pH determinations. In this delivery group, the trace ICP elements were reported from a ten-fold dilution rather than the one-hundred fold dilution with the comparable results between the two dilution analyses. Included in the data package are the raw data for both dilution analyses.

A volatile organic holding blank, HB116A, was carried through the sample storage period and analyzed with the samples reported in this package. The results for this blank were all nondetect except for acetone, which was detected below the reporting limit but above the instrument detection limit. Although acetone was present at trace levels in the holding blank, acetone was not detected in any of the field samples. As such, the occurrence of potential cross-contamination during sample storage was unlikely.

The laboratory case narrative noted the nitroaromatic analysis of the blank spike sample B8LCS yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded a recovery of 60%. The laboratory has not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ), with a low bias direction.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory log-in sheet noted that the W-6 bottle submitted for sample SC-1B-T01N-GRW was not marked on chain of custody form. The bottle was received for this sample and it was logged in for the appropriate W-6 analyses.
Holding Times	No	The 48-hour holding time for nitrate was exceeded by several hours for all samples. The 48-hour holding times for nitrite and orthophosphate were exceeded by several hours for the majority of the relevant samples in this data package. The 7-day holding time for TDS was exceeded for MMW-44A-T01N-GRW. According to the laboratory case narrative, the TDS analysis was originally accomplished within holding time, however the net weight was above the method specified limit of >0.2g. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 5-6 days after sampling and 3-4 days beyond login. The pH for all samples was measured 6-7.5 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Copper was detected in three of the continuing calibration blanks but all copper analyses were detected at concentrations greater than 5x the blank concentration. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. Detection, below the reporting limit, of bis(2-Ethylhexyl) phthalate was found in semi-volatile blank SBLKY7. No qualification was needed due to nondetection of compound in semi-volatile sample analysis.
Matrix QC • MS/MSD SPRING13PUMP-T01N-GRWS SPRING13PUMP-D01N-GRWS • PDS SPRING13PUMP-T01N-GRWA SPRING13PUMP-D01N-GRWA • LD SPRING13PUMP-T01N-GRWD SPRING13PUMP-D01N-GRWD	No	Sulfate was recovered in the matrix spike analysis of sample SPRING13PUMP-T01N-GRW below the control criteria of 75-125% but greater than 30%, suggesting a potential low bias in the reporting of these analytes in samples. Total alkalinity and phosphorous were recovered in the matrix spike analysis of sample SPRING13PUMP-T01N-GRW below the control criteria of 75-125% and less than 30%. Because total alkalinity and phosphorous were both nondetect, the results are qualified as unusable. Nitrate, orthophosphate and total organic carbon were recovered in the matrix spike analysis of sample SPRING13PUMP-T01N-GRW in excess of the control criteria of 75-125%, indicating a possible high bias in sample results. Table 1.3 summarizes these analytes along with the associated percent recoveries and the qualification codes assigned to the parent samples. Sample SPRING13PUMP-T01N-GRW matrix spike concentrations for aluminum and manganese were greater than 4x the spiking concentration and were therefore considered inappropriate for assessing accuracy for sample specific matrix affects. Sample SPRING13PUMP-D01N-GRW matrix spike concentrations for aluminum, manganese, and iron were greater than 4x the spiking concentration and were therefore considered inappropriate for assessing accuracy for sample specific matrix affects. Post digestion spikes were performed on the metal analytes that did not meet the specified criterion for the initial matrix spike recoveries. All post digestion spike recoveries for these analytes were within acceptance limits and did not therefore require qualification on this basis.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		No qualification of data was necessary on the basis of laboratory duplicate criteria for any analysis. For the analytes for which both sample and duplicate sample results were greater than 5x the RL, the RPD was not outside the control criteria of +/-20%. For the remaining analytes, the absolute difference between the sample and duplicate sample result was not greater than 1x the RL for aqueous matrices. The matrix quality control results for the June 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the DVR.
Method QC • Surrogates • Serial Dilution (A) SPRING13PUMP-T01N-GRWSL SPRING13PUMP-D01N-GRWSL • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses on the matrix spikes of samples SPRING13PUMP-T01N-GRW and SPRING13PUMP-D01N-GRW were applicable for 4 of the 24 metal analytes, as all initial sample results (with the exception of 20) were sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent differences (%Ds) between the initial sample results and the serial dilution results (5x) were compared to an evaluation criteria of ±10% for the 4 analytes. Table 1.4 summarizes the one analyte that needed qualification. Several results for orthophosphate and phosphorus were qualified as estimate on the basis of total versus partial disagreement and assigned a qualifier code of "TvP" with an indeterminate bias direction. Table 1.5 summarizes the results qualified along with the concentrations reported. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank TB211-GRW	Yes	No target analytes were detected in the trip blank sent to the laboratory with these samples. As such, there is no evidence that cross-contamination occurred during sample storage and transport. This package did not include any field duplicates, rinsate blanks or field blanks. However, all field QC results will be evaluated collectively and any resultant data qualification will be discussed in the DVR for June 2003 sampling event.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of nondetect results with elevated RLs were due to results qualified as nondetect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	URS was provided with a sample volume comparable to what USGS was collecting for their sampling program. As such, the inorganic bottles provided only covered a limited number of the RI/FS inorganics.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results • VOCs: Continuing Calibration • SVOCs: Continuing Calibration As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Refer to table 1.6 for SVOC and VOC qualifications.

Table 1.1
Holding Time Results Outside Evaluation Criteria and Resultant Data Qualification

Sample	Nitrate as N	Nitrite	Ortho-P	TDS	Cond.	pH
SC-1A-T01N-GRW	0.40 UJ	---	---	---	2660 J	4.1 J
SC-1B-T01N-GRW	0.40 UJ	---	---	---	3100 J	6.8 J
MMW-45B-T01N-GRW	0.40 UJ	0.0050 UJ	0.22 J	---	2520 J	4.1 J
MMW-10A-T01N-GRW	4.8 J	---	---	---	2270 J	4.5 J
MMW-29A-T01N-GRW	3.7 J	0.0050 UJ	---	---	1450 J	4.9 J
MMW-44A-T01N-GRW	0.40 UJ	0.0050 UJ	---	4910 J	3370 J	3.7 J
MMW-33A-T01N-GRW	3.1 J	---	---	---	1760 J	4.3 J
SPRING39PUMP-T01N-GRW	1.7 J	0.0050 UJ	0.16 J	---	1270 J	5.0 J
GWW-3-T01N-GRW	3.3 J	0.0050 UJ	0.10 J	---	1900 J	4.4 J
SPRING13PUMP-T01N-GRW	0.40 UJ	0.0050 UJ	0.071 J	---	1400 J	3.7 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P)	0.3	0.3	---	0.4	---	---	0.3	GWW-3-D01N-GRW GWW-3-T01N-GRW MMW-10A-D01N-GRW MMW-10A-T01N-GRW MMW-29A-T01N-GRW MMW-33A-T01N-GRW SC-1B-D01N-GRW SC-1B-T01N-GRW SPRING13PUMP-D01N-GRW SPRING13PUMP-T01N-GRW SPRING39PUMP-D01N-GRW SPRING39PUMP-T01N-GRW	U CCB-I
Mercury (CV)	---	---	---	-0.1	---	---	0.1	MMW-10A-D01N-GRW MMW-10A-T01N-GRW MMW-29A-D01N-GRW MMW-29A-T01N-GRW MMW-44A-T01N-GRW MMW-45B-D01N-GRW MMW-45B-T01N-GRW SC-1A-D01N-GRW SC-1A-T01N-GRW SC-1B-D01N-GRW SC-1B-T01N-GRW	UJ CCB-L
Zinc (P)	---	---	---	---	---	5.864	3.0	SC-1B-D01N-GRW	U MB-I

MB=Method Blank CV-Manual Cold Vapor AA P=ICP CCBx-Continuing Calibration Blank
RL= Reporting Limit DL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Comment	Action[1]
SPRING13PUMP-T01N-GRW					
Nitrate	135.8	NA	75-125%	Nondetect; therefore not affected by suggested potential high bias.	No Qualification
Orthophosphate	152.3	NA		None	J MS-H
Phosphorous	5.2	NA			R
Sulfate	74.5	NA			J MS-L
Total Alkalinity	3.3	NA		Acidic nature of sample (pH=3.7) neutralizes the spike resulting in reduced recovery.	No Qualification was considered necessary
Total Organic Carbon	134.5	NA		None	J MS-H
Cyanide	44.0	102.8			UJ MS-L
SPRING13PUMP-D01N-GRW					
Arsenic	73.1	98.2	75-125%	None	UJ MS-L

NA = Not appropriate
RL = Reporting limit (generally the IDL for dilution)
IDL = Instrument detection limit

[1]Qualification was limited to parent sample at this time.

Table 1.4
Serial Dilutions Resulting in
Parent Sample Qualifications

Analyte	%D	Qualification
SPRING13PUMP-T01N-GRWSL		
Copper	16.4	J DL-H

Table 1.5
Total vs. Partial Qualifications Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Orthophosphate (mgL)	Total Phosphorous (mg/L)	RL for both analyses (mg/L)	Criteria	Qualification Code
MMW-45B-T01N-GRW	0.22	0.076	0.010	>30% Diff	J TvP-I Or UJ TvP-I
MMW-10A-T01N-GRW	0.10	0.039		|Diff|>2xRL	
MMW-29A-T01N-GRW	0.068	0.019		|Diff|>2xRL	
MMW-44A-T01N-GRW	0.31	0.10		>30% Diff	
MMW-33A-T01N-GRW	0.18	0.010		|Diff|>2xRL	
SPRING39PUMP-T01N-GRW	0.16	0.010		|Diff|>2xRL	
GWW-3-T01N-GRW	0.10	0.040		|Diff|>2xRL	

RL=Reporting Limit

Table 1.6
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
6/5/03 (2101)	Acetone 2-Butanone	28.4 25.2	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I
SVOC CCAL Date/Time	**Analyte**	**|%D| >25%**	**Action**	**Qualification and Qualification Codes**
6/16/03 (1353)	Benzaldehyde	-39.2	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT117C

Sampling Event: June 2003 GRW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 08/15/03

Peer Reviewer: Stacey Coker

Date Completed: 08/18/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
RR-USSPRING13-T01N-SFW	SA	529535	RR-USSPG13-T01NSFW RR-USSPG13-T01N-SFW	W	X	X	X	X
RR-USSPRING13-D01N-SFW	SA	529536	RR-USSPG13-D01NSFW RR-USSPG13-D01N-SFW	W	X			
MW-23-T01N-GRW	SA	529537		W	X	X		
MW-23-D01N-GRW	SA	529538		W	X			
MW-23-T01D-GRW	FD	529539		W	X	X		
MW-23-D01D-GRW	FD	529540		W	X			
SC-8A-T01N-GRW	SA	529662		W	X	X		
SC-8A-D01N-GRW	SA	529663		W	X			
SC-5B-T01N-GRW	SA	529873		W	X	X[3]		
SC-5B-D01N-GRW	SA	529874		W	X			

Matrix: W = Water
QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.
[3]Received split from USGS. As such, suite of inorganics is limited due to volume provided.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

It is noted that the Total Kjeldahl Nitrogen (TKN) analysis by method 351.3 was subcontracted to STL's Seattle, Washington facility, to ensure that the analytical holding time of 28 days was met for this method. This does not affect the quality or usability of the data.

The laboratory case narrative noted the matrix spike and replicate analyses of nitrite for sample RR-USSPRING13-T01N-SFW were inadvertently overlooked. During the laboratory data review process, long after the holding time of 48 hours had been exceeded, this error had been discovered. Consequently, these quality control analyses were not analyzed or reported. This did not adversely affect the completeness of the data package provided the frequency of QC parameters were met overall for the June 2003 sampling event.

As noted in the laboratory case narrative, the ICP/MS metals analyses of the seven continuing calibration check standards associated with the samples in this delivery group, reported five calibration verifications percent recoveries for silver marginally above the control limit of 90-110%. Because all silver results were nondetect, the potential high bias suggested by the marginally high CCV did not affect the quality or usability of the data. As such, no silver results were qualified based on the CCV results..

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	According to the laboratory log-in sheet, the chain of custody erroneously listed that a W-3 container was sampled and sent to the lab for the analysis of sample SC-5B-T01N-GRW. However, the laboratory received an unpreserved W-6 container, as provided by the USGS. No data qualification was necessary and completeness was not affected by this inadvertent error on the COC form.
Holding Times	No	The laboratory case narrative noted the nitrate analyses for all samples in this delivery group were accomplished two days beyond the prescribed analytical holding time due to a malfunction for the IC instrument autosampler device. All nitrate analyses were accordingly qualified as estimated (J/UJ). The 48-hour holding times for nitrite, BOD_5, and orthophosphate were exceeded by several hours for the majority of the relevant samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken five days after sampling and three days beyond log-in. The pH for all samples was measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD RR-USSPRING13-T01N-SFW • PDS • LD RR-USSPRING13-T01N-SFW	Yes	Orthophosphate, sulfate, and TOC were recovered in the matrix spike analysis of sample RR-USSPRING13-T01N-SFW below the control criteria of 75-125%, suggesting a potential low bias in the reporting of these analytes in samples. Lead was recovered in the matrix spike analysis of sample RR-USSPRING13-T01N-SFW in excess of the control criteria of 75-125%, indicating a possible high bias of lead in sample results. Table 1.3 summarizes these analytes along with the associated percent recoveries and the qualification codes assigned to the parent samples. Table 1.4 summarizes laboratory duplicate analyses which resulted in qualification, along with the qualification codes. The matrix quality control results for the June 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (A) RR-USSPRING13-T01N-SFW RR-USSPRING13-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analyses on samples RR-USSPRING13-T01N-SFW and RR-USSPRING13-D01N-SFW were applicable for 20 of the 24 metal analytes, as all initial sample results (with the exception of four) were sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent differences (%Ds) between the initial sample results and the serial dilution results (5x) were compared to an evaluation criteria of ±10% for the 20 analytes. Aluminum in both total and dissolved fractions for this sample was qualified as estimated (J/UJ), with a low bias direction assigned. The zinc result for the total fraction of this parent sample was qualified as estimated The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5. The orthophosphate and phosphorus results for samples MW-23-T01D-GRW and MW-23-T01N-GRW were qualified as estimated (J/UJ TVP-I) because the orthophosphate results were greater than the phosphorus results.
Field QC • Field Duplicate MW-23-T01D-GRW MW-23-D01D-GRW • Rinsate Blank • Field Blank • Trip Blank	Yes	Chloride was qualified as estimated (J), with an indeterminate bias, on the basis of field duplicate disagreement for samples MW-23-T01N-GRW and MW-23-T01D-GRW. Due to the fact that both chloride results were greater than 5x the RL (0.40 mg/L), the RPD between the two results (45%) was compared to an acceptable RPD of ≤30%. The field QC results for the June 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	As summarized in the case narrative section, the matrix spike and laboratory duplicate analyses were not run on sample USSPRING13-T01N-SFW for nitrite.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	BOD_5	Cond.	pH
RR-USSPRING13-T01N-SFW	0.40 UJ	0.0050 UJ	0.030 J	1.5 UJ	191 J	6.7 J
MW-23-T01N-GRW	0.86 J	0.0052 J	---	---	403 J	7.6 J
MW-23-T01D-GRW	0.75 J	0.0050 UJ	---	---	378 J	7.6 J
SC-8A-T01N-GRW	0.40 UJ	0.0050 UJ	0.040 J	---	386 J	6.3 J
SC-5B-T01N-GRW	0.40 UJ	0.0050 UJ	0.11 J	---	2260 J	7.1 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminium (P)	88.3	99.4	75.6	--	59.2	68.320	50.3	RR-USSPRING13-D01N-SFW	U MB,CCB-I
Beryllium (P)	-0.5	0.5	---	0.5	---	-0.464	0.3	All samples	UJ MB, CCB-L UJ MB-L
Iron (P)	---	40.4	---	---	---	---	31.1	RR-USSPRING13-D01N-SFW	U CCB-I
Mercury (CV)	---	---	---	-0.1	---	---	0.1	SC-5B-D01N-GRW SC-5B-T01N-GRW SC-8A-D01N-GRW SC-8A-T01N-GRW	UJ CCB-L
Nickel (P)	---	---	---	---	---	21.480	3.0	MW-23-T01N-GRW RR-USSPRING13-D01N-SFW RR-USSPRING13-T01N-SFW SC-8A-D01N-GRW SC-8A-T01N-GRW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results And Parent Sample Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Comment	Action
RR-USSPRING13-T01N-SFW					
Orthophosphate	72.7	NA	75-125%	NONE	J MS-L parent
Sulfate	72.8	NA			
Total Organic Carbon	36.0	NA			
Lead	138.6	101.7			J MS-H parent

NA = Not appropriate

Table 1.4
Laboratory Duplicate Results and Parent Sample Qualifications

Analyte	Result (mg/L)	Duplicate (mg/L)	RL* (mg/L)	Criterion	Qualification
Lead	1.36 (µg/L)	5.14 (µg/L)	2.0 (mg/L)	Diff > 1xRL	J D-I
Chloride	1.7	2.2	0.20	RPD>25%	
Orthophosphate	0.030	0.010 U	0.010	Diff > 1xRL	
Phosphorus	0.067	0.092	0.010	RPD>25%	

*CRDL used in place of the RL for metal analytes

[NOT DOCUMENT/FILE SUBMITTED]

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT119A

Sampling Event: June 2003

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 08/26/03

Peer Reviewer: Stacey Coker

Date Completed: 08/28/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses					
					Metals	Inorganics	VOCs	SVOCs	Explosives	Pesticides
SC-4A-T01N-GRW	SA	529869		W	X	X[3]				
SC-4A-D01N-GRW	SA	529870		W	X					
SC-5A-T01N-GRW	SA	529871		W	X	X[3]				
SC-5A-D01N-GRW	SA	529872		W	X					
SC-3A-T01N-GRW	SA	529873		W	X	X				
SC-3A-D01N-GRW	SA	529874		W	X					
SC-3B-T01N-GRW	SA	529875		W	X	X				
SC-3B-D01N-GRW	SA	529876		W	X					
SC-6A-T01N-GRW	SA	529877		W	X	X				
SC-6A-D01N-GRW	SA	526878		W	X					

Matrix: W = Water QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank
FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.
[3] Received split from USGS. As such, suite of inorganics is limited due to volume provided.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The metal analyses of the samples in this SDG were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations. The exception to this was the reporting of aluminum, cadmium, calcium, cobalt, chromium, iron, magnesium, manganese, nickel, potassium, sodium, and zinc from the trace ICP analysis for select samples due to results that were over range on the ICP/MS.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	According to the laboratory log-in sheet, the chain of custody erroneously listed that a W-3 container was sampled and sent to the lab for the analysis of samples SC-4A-T01N-GRW and SC-5A-T01N-GRW. However, the laboratory received an unpreserved W-6 container, as provided by the USGS.
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Beryllium, iron, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the June 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution SC-3A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution test for samples SC-3A-T01N-GRW was applicable for 5 of the 24 metals. The serial dilution results for the June 2003 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any site-specific field quality control samples. The field quality control results for the June 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)
SC-4A-T01N-GRW	0.40 UJ	0.005 UJ	0.32 J
SC-5A-T01N-GRW	0.40 UJ	0.005 UJ	0.32 J
SC-3A-T01N-GRW	0.40 UJ	0.005 UJ	0.01 UJ
SC-3B-T01N-GRW	0.40 UJ	0.005 UJ	0.01 UJ
SC-6A-T01N-GRW	0.40 UJ	0.005 UJ	0.015 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P) DF=10	0.4	---	0.3	SC-3A-D01N-GRW, SC-4A-T01N-GRW, SC-4A-D01N-GRW, SC-5A-T01N-GRW, SC-5A-D01N-GRW, SC-6A-T01N-GRW, SC-6A-D01N-GRW	U CCB-I
Iron (P) DF=10	---	35.7	31.1	SC-5A-T01N-GRW, SC-5A-D01N-GRW	U CCB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit RL= Reporting Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT120C

Sampling Event: June 2003 GRW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 08/28/03

Peer Reviewer: Alan Roberts

Date Completed: 09/02/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses							
					Metals	Inorganics	Pesticides	PCDD/PCDFs	DRO	VOCs	SVOCs	GRO
RB02T-SOL	RB	530322		W	X	X	X	X[3]				
EASTSEEP-T01N-GRW	SA	530714		W	X	X						
EASTSEEP-D01N-GRW	SA	530715		W	X							
003EASTSEEP-T01N-GRW	SA	530716	003EASTSEEP-T01N-GR	W	X	X						
003EASTSEEP-D01N-GRW	SA	530717	003EASTSEEP-D01N-GR	W	X							
003WESTSEEP-T01N-GRW	SA	530718	003WESTSEEP-T01N-GR	W	X	X						
003WESTSEEP-D01N-GRW	SA	530719	003WESTSEEP-D01N-GR	W	X							
WESTSEEP-T01N-GRW	SA	530720		W	X	X				X	X	X
WESTSEEP-D01N-GRW	SA	530721		W	X	X						
RB03T-SOL	RB	530722		W	X	X						
FB01T-SOL	FB	530723		W			X	X[3]				
TB221-GRW	TB	530724		W						X		
RB01T-SOL	RB	530808		W	X	X						
TPZ7U-T01N-GRW	SA	531746		W	X	X						
TPZ7U-D01N-GRW	SA	531747		W	X							
DECANT-T01N-SFW	SA	531770		W					X			

Matrix: W = Water
QC Type: SA = Sample RB = Rinsate Blank FB = Field Blank TB = Trip Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.
[3]Analysis 8290 Dioxins/Furans at Stl-Knoxville (Data for these results will be presented in another data package).

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

_____ Data are usable without qualification.

__X__ Data are usable with qualification (noted below).

_____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by the client and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations. The laboratory noted aluminum, cadmium, calcium, cobalt, chromium, iron, magnesium, manganese, nickel, potassium, sodium, and zinc were reported from the 10-fold dilution analysis. The results from this analysis were compared to the 100-fold analysis, yielding comparable results. The 10-fold analysis limited the number of elements reported as non-detect at elevated reporting limits, which the laboratory notes, has been shown to influence the ion balances in some cases. This did not adversely affect the quality or usability of the data.

The metals analysis of the ICV yielded a marginally elevated response of 118.8% for potassium, with a control criterion of 90-110%. Due to the fact that the recovery was only marginally high and subsequent CCV recovery was within limits, no data qualification was considered necessary.

The pesticide analyses of the blank spike samples N2LCS and N2LCSD yielded elevated recoveries of endrin, (130%) above the QC limits of 53-121%, suggesting a potential high bias in reported results. Due to the fact that all pesticide results were nondetect, no qualification was considered necessary.

The laboratory noted manual integration was employed in deriving results for the volatile and semivolatile organics analyses in this delivery group. The values derived from manual integration were qualified by the laboratory on the quantitation reports. Included in the data package were the extracted ion current profiles.

A volatile organic holding blank was carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and labeled HBW120C. All results for HBW120C were nondetect, as such, it is unlikely that any cross-contamination resulted from sample storage.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory log-in sheet noted the chain of custody erroneously listed samples 003WESTSEEP-T01N-GRW and WESTSEEP-T01N-GRW as 003WESTSEEP and WESTSEEP. In addition, the laboratory log-in sheet noted sample TPZ7U-T01N-GRW was listed on the COC for inorganics analysis. However, upon receipt at the lab, bottles were received for metals analysis only. This was done per the client's (URS) request, as no bottles were filled or sent to the lab for inorganics analysis. This was the result of a decision made with EPA concurrence (meetings – Denver 06/11-12/03). The laboratory log-in sheet noted that a trip blank sample was received (TB01T-SOL), but not logged in, as no volatile analyses were requested for any of the samples in this delivery group. However, upon review of the data sheets, it was noted that volatile results were reported for samples TB01T-SOL and WESTSEEP-T01N-GRW. This comment by the lab was not accurate.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		No data qualification was necessary and completeness was not affected by these inadvertent errors on the COC form.
Holding Times	No	The laboratory case narrative noted the original nitrate analyses for samples EASTSEEP-T01N-GRW and RB03T-SOL were performed within holding time on a run sequence that did not include a closing calibration check standard, (due to a malfunction of the IC instrument auto-sampler device). Accordingly, these samples were re-analyzed one day beyond the holding time of 48 hours. Samples RB01T-SOL and RB 02T-SOL were re-analyzed four and two days, respectively, beyond the holding time for the same reason. The nitrate results for these four samples (data from second acquisition reported), in addition to other samples exceeding holding time limits, were qualified as estimated (J) with an indeterminate direction of bias. As mentioned in the laboratory case narrative, the original cyanide analysis of sample EASTSEEP-T01N-GRW was performed within holding time limit on a run sequence that did not meet quality control criteria. Accordingly, this sample was re-analyzed one day beyond the analytical holding time limit of 14 days. The cyanide result for this sample (data from second acquisition reported) was qualified as estimated (J). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 19/20 days after sampling and 18 days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2a summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations. Several analytes were detected in the volatile and semivolatile blanks. Table 1.2b summarizes the volatile and semivolatile blanks detections and resultant data qualifications (limited to those analytes and samples requiring qualification). Several tentatively identified compounds were reported as present in the semivolatile blank SBLKB5. TICs in method blanks are not considered to be reportable as TICs for samples and their identification as TICs was rejected. The multiple unknown compounds not detected in the method blank were qualified as (NJ) to note the analyses indicated the presence of an analyte that had been "tentatively identified" and the associate numerical value represented its approximate value.
Matrix QC • MS/MSD • PDS • LD	Yes	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the June 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution EASTSEEP-TO1N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	A serial dilution test was conducted on one sample. The serial dilution results could be used to assess potential interferences for two of the 24 metals analyzed by ICP. None of the serial dilution results were outside the evaluation criterion of ±10%. Therefore no data qualification was considered necessary. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank RB01T-SOL RB02T-SOL RB03T-SOL • Field Blank FB01T-SOL • Trip Blank TB221-GRW	Yes	Table 1.3 summarizes analytes detected in the field QC samples analyzed with this data package. The field QC results for the June 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL. Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration Tables 1.4 summarizes the continuing calibration results that were outside the evaluation criteria in SOP 12.1 and any resultant data qualification issues. • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications

Sample	Nitrate as N	Conductivity	pH	Cyanide
RB02T-SOL	0.40 UJ	---	---	---
EASTSEEP-T01N-GRW	0.40 UJ	1890 J	7.7 J	---
003EASTSEEP-T01N-GRW	0.40 UJ	2060 J	7.7 J	15.4 J
003WESTSEEP-T01N-GRW	0.40 UJ	2430 J	7.6 J	---
WESTSEEP-T01N-GRW	---	1730 J	7.4 J	---
RB03T-SOL	0.40 UJ	---	---	---
RB01T-SOL	0.40 UJ	---	---	---

Table 1.2a
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Lead (P)	---	---	---	---	---	0.297	0.1	003EASTSEEP-D01N-GRW 003EASTSEEP-T01N-GRW 003WESTSEEP-D01N-GRW 003WESTSEEP-T01N-GRW EASTSEEP-D01N-GRW EASTSEEP-T01N-GRW RB01T-SOL RB02T-SOL RB03T-SOL WESTSEEP-D01N-GRW	U MB-I
Potassium (P)	1082.0	---	-534.4	2129.0	---	1643.00	393.0	All samples with the **exception of:** TPZ7U-D01N-GRW TPZ7U-T01N-GRW	U MB,CCB-I UJ CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2b
Organics Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (µg/L)	Samples Qualified	Qualification and Qualification Codes
VBLKO1	06/18/03	1,2,4-Trichlorobenzene	1	WESTSEEP-T01N-GRW	U MB-I
SBLKB5	06/20/03	Bis(2-Ethylhexyl) phthalate	4	WESTSEEP-T01N-GRW	U MB-I

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Field Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (mg/L)	RL (mg/L)
RB02T-SOL	06/09/03	Chloride	0.75	0.20
		Ammonia-Nitrogen	0.070	0.040
RB03T-SOL	06/11/03	Ammonia-Nitrogen	0.069	0.040
		Total Kjeldahl Nitrogen	0.280	0.240
		Beryllium	0.26 (µg/L)	0.20 (µg/L)
RB01T-SOL	06/11/03	Ammonia-Nitrogen	0.048	0.040
		Sulfate	6.3	5.0

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.4
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
VOC	06/19/03	Acetone	66.4	None of the samples were associated with this event	No Qualification
		2-Butanone	48.1		
		2-Hexanone	31.4		
SVOC	06/20/03	2,4-Dinitrophenol	49.0	WESTSEEP-T01N-GRW	UJ CCAL-I
		4-Nitrophenol	25.8		
		4,6-Dinitro-2-methylphenol	27.1		

CCAL = Continuing Calibration %D = Percent difference

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT121C

Sampling Event: June 2003 GRW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 08/19/03

Peer Reviewer: Stacey Coker

Date Completed: 09/08/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
CabinSprings-T01N-GRW	SA	532375	W	X	X[2]
CabinSprings-D01N-GRW	SA	532376	W	X	

Matrix: W = Water
QC Type: SA = Sample FD = Field Duplicate
[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2]Inorganics reported were limited due to the bottles submitted.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any comments in the laboratory case narrative are included in the appropriate section in the table.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory log-in sheet noted the chain of custody erroneously listed samples CabinSprings-T01N-GRW and CabinSprings-D01N-GRW as surface water matrices. In addition, the laboratory log-in sheet notes sample CabinSprings-T01N-GRW was listed on the COC with three different sampling times. The laboratory recorded the sampling time for this sample as 1033. As no W-3, W-4, or W-5 bottles were sent to the laboratory (only W-1, W-2, W-6, and W-8 were sent), no analyses were run for TOC, TKN, ammonia, or total phosphorus. No data qualification was necessary and completeness was not affected by these inadvertent errors on the COC form.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. The conductivity measurement for sample CabinSprings-T01N-GRW was taken five days after sampling and four days beyond log-in. The pH for the same sample was measured approximately five hours beyond log-in. Therefore, the conductivity and pH results for this sample were qualified as estimated (J/UJ).
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.
Matrix QC • MS/MSD • PDS • LD	Yes	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the June 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution CabinSprings-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The internal standard recovery of ^{89}Y was high for the ICPMS analyses of samples CabinSprings-T01N-GRW and CabinSprings-D01N-GRW. Accordingly, molybdenum results for these samples, as verified by the run-logs, were reported form the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution analysis on sample CabinSprings-T01N-GRW was applicable for eight of the 24 metal analytes, as the initial sample results for the eight analytes were sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent differences (%Ds) between the initial sample results and the serial dilution results (5x) were compared to an evaluation criteria of ±10% for the 20 analytes. Results for two analytes were out, as summarized in Table 1.2. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	Yes	No field QC samples were analyzed with this data package. The field QC results for the June 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Blank Detections Resulting in Data Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Chromium (P)	-2.1	-1.6	-1.5	-2.0	---	-1.532	0.6	CabinSprings-D01N-GRW CabinSprings-T01N-GRW	UJ MB, CCB-L
Iron (P)	-33.0	---	-17.4	-17.7	---	-24.100	16.8		

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	% D	Qualification
CabinSprings-T01N-GRW		
Cadmium	13.3	J DL-L
Cobalt	12.5	

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE JULY 2003 QUARTERLY GROUNDWATER SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

March 2004

URS

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Project No. 2236241.00100

141296

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Summary of Reanalyses 2-1

Section 3 Data Review Process 3-1

Section 4 Data Review Commentary 4-1

4.1 Data Review Narratives 4-1
4.2 General Data Quality Issues 4-1
4.2.1 Dilution Schemes/Non-Detects With Elevated Rls 4-1
4.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 4-1
4.2.3 Non-Valid Matrix Spikes 4-2
4.2.4 Laboratory Performance Review (LPR) Findings 4-2

Section 5 Collective Summary of Field QC Results 5-1

5.1 Matrix Spike Results (Accuracy Evaluation) 5-2
5.1.1 Metals and Inorganic Matrix Spike Results 5-2
5.1.2 Post-Digestion Spikes 5-4
5.1.3 Organic Matrix Spike Results 5-4
5.2 Laboratory Duplicates (Precision Evaluation) 5-5
5.2.1 Metal and Inorganic Laboratory Duplicates 5-5
5.2.2 Organic Spikes Duplicate Results 5-5
5.3 Serial Dilution Results 5-6

Section 6 Collective Summary/Assessment of Field QC Results 6-1

6.1 Field Duplicate Samples 6-1
6.2 Rinsate Blank Results 6-2
6.3 Field Blank Results 6-5

Section 7 Overall Data Quality Indicator Assessment 7-1

7.1 Precision 7-1
7.2 Accuracy 7-1
7.3 Completeness 7-2
7.4 Representativeness 7-2
7.5 Comparability 7-3
7.6 Sensitivity 7-3

TABLE OF CONTENTS

List of Tables

Table 1-1	Summary of Groundwater Samples Collected During July, 2003 Sampling Event
Table 2-1	Summary of Reanalysis for Groundwater August, 2003 Sampling Event
Table 5-1	Field Samples Submitted for Matrix Spike
Table 5-2	Count of Matrix Spike Samples Collected in July, 2003 Sampling Event
Table 5-3	Matrix Spike Outliers and Corresponding Results Qualification for Inorganic and Metal Groundwater Samples
Table 5-4	Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Organic Groundwater Samples
Table 5-5	Laboratory Duplicate Exceedances for Groundwater Samples
Table 5-6	ICP Serial Dilution Exceedances for Groundwater Samples
Table 6-1	Summary of Field Duplicate Water Samples Collected Summer 2003
Table 6-2	Field Duplicate Collection Frequency for the July, 2003 Sampling Event
Table 6-3	Field Duplicate Exceedance for Groundwater Samples
Table 6-4	Rinsate Blank Collection During the July, 2003 Sampling Event
Table 6-5	Rinsate Blank Collection Frequency for the July, 2003 Sampling Event
Table 6-6	Summary of Groundwater Rinsate Blank Results and Additional Qualifications
Table 6-7	Field Blanks Collected During the July, 2003 Sampling Event
Table 6-8	Field Blank Collection Frequency for the July, 2003 Sampling Event
Table 7-1	Summary of Precision Assessment for July 2003
Table 7-2	Summary of Accuracy Assessment for July 2003

TABLE OF CONTENTS

List of Attachments

Attachment 1.1	Data Package WAT122C
Attachment 1.2	Data Package WAT123A
Attachment 1.3	Data Package WAT124C
Attachment 1.4	Data Package WAT125C
Attachment 1.5	Data Package WAT126C
Attachment 1.6	Data Package WAT127C
Attachment 1.7	Data Package WAT128C
Attachment 1.8	Data Package WAT129C
Attachment 1.9	Data Package WAT130A
Attachment 1.10	Data Package WAT131C
Attachment 1.11	Data Package WAT136C
Attachment 1.12	Data Package WAT137A
Attachment 1.13	Data Package WAT140C
Attachment 1.14	Data Package WAT144C
Attachment 1.15	Data Package WAT145A
Attachment 1.16	Data Package WAT146A
Attachment 1.17	Data Package WAT147A
Attachment 1.18	Data Package WAT148C
Attachment 1.19	Data Package WAT149A
Attachment 1.20	Data package WAT151C
Attachment 1.21	Data Package WAT152A
Attachment 1.22	Data Package WAT153A
Attachment 1.23	Data Package WAT154C
Attachment 1.24	Data Package WATRAS4
Attachment 1.25	Data Package 98732

This Data Validation Report (DVR) provides a general overview of the usability of chemical data obtained from the July 2003 sampling activities at Molycorp. In addition, this data validation report is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

This report contains the results of the data validation conducted for groundwater samples collected in July of 2003 at the Molycorp Questa Mine, Questa, New Mexico. These water samples were collected in support of the Remedial Investigation/Feasibility Study (RI/FS). The water samples were sent to Severn Trent Laboratories (STL) Burlington in Colchester, VT. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods used and quality control samples collected were in accordance with the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). The results were reported in seven original data packages.

The groundwater samples collected during the July 2003 sampling event and their associated chemical analyses are summarized in Table 1-1. Included in these tables is the frequency of QC samples collected for each matrix.

Table 1-1
Summary of Groundwater Samples Collected During July, 2003 Sampling Event

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganic	VOCs	SVOCs	TPH	Explosives
US-1-T01N-GRW (WAT122C)	X, MS, LD	X, MS, LD	X, MS, LD				
SPRING 9-T01N-GRW (WAT122C)	X	X	X				
OUTFALL 002 PIPE-T01N-GRW (WAT122C)	X	X	X				
LS-3-T01N-GRW (WAT122C)	X	X	X				
LS-1-T01N-GRW (WAT122C)	X	X	X				
MW-1-T01N-GRW (WAT122C)	X, MS, LD	X, MS, LD	X, MS, LD				
LS-2-T01N-GRW (WAT122C)	X	X	X				
SPRING 9A-T01N-GRW (WAT122C)	X	X	X				
SPRING 10-T01N-GRW (WAT122C)	X	X	X				
DECANT-T01N-GRW (WAT122C)[2]	X	X	X			X	
DOUGLAS WELL-T01N-GRW (WAT123A)	X	X	X				
EASTSEEP-T01N-GRW (WAT124C)	X	X	X				
OUTFALL 002-T01N-GRW (WAT124C & WATRA4)	X	X	X				
EMBARGO ROAD SEEP-T01N-GRW (WAT124C)	X	X	X				
MW-B-T01N-GRW (WAT124C)	X	X	X				
MW-4-T01N-GRW (WAT124C)	X	X	X				
MW-23-T01N-GRW (WAT124C)	X	X	X				
003 WEST SEEP-T01N-GRW (WAT124C)	X	X	X				
003 EAST SEEP-T01N-GRW (WAT124C)	X	X	X				
EW-5D-T01N-GRW (WAT124C)	X	X	X				
EW-1-T01N-GRW (WAT124C)	X	X	X				
MW-11-T01N-GRW (WAT125C)	X	X	X				
MW-CH-T01N-GRW (WAT125C)	X	X	X				
EW-6-T01N-GRW (MW-3) (WAT125C)	X	X	X				
EW-5B-T01N-GRW (WAT125C)	X	X	X				
EW-5A-T01N-GRW (WAT125C)	X, FD	X, FD	X, FD				
MW-13-T01N-GRW (WAT125C)	X	X	X				
MW-17-T01N-GRW (WAT125C)	X	X	X				
MW-A-T01N-GRW (WAT125C)	X, MS, LD	X, MS, LD	X, MS, LD				

Table 1-1
Summary of Groundwater Samples Collected During July, 2003 Sampling Event

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganic	VOCs	SVOCs	TPH	Explosives
MW-2-T01N-GRW (WAT126C)	X	X	X				
MW-7C-T01N-GRW (WAT126C)	X	X	X				
MW-20-T01N-GRW (WAT126C)	X, FD	X, FD	X, FD				
MW-12-T01N-GRW (WAT126C)	X, FD	X, FD	X, FD				
WEST SEEP-T01N-GRW (WAT126C)	X	X	X				
003 CENTRAL SEEP-T01N-GRW (WAT126C)	X	X	X				
MW-7A-T01N-GRW (WAT126C)	X	X	X				
MW-22-T01N-GRW (WAT126C)	X	X	X				
US-2-T01N-GRW (WAT127C)	X	X	X				
MW-26-T01N-GRW (WAT127C)	X	X	X				
MW-9A-T01N-GRW (WAT127C)	X, RB	X, RB	X, RB				
EW-3-T01N-GRW (WAT127C)	X	X	X				
EW-5C-T01N-GRW (WAT127C)	X	X	X				
MW-27-T01N-GRW (WAT127C)	X	X	X				
MW-21-T01N-GRW (WAT127C)	X	X	X				
MW-10-T01N-GRW 9WAT127C)	X	X	X				
MW-28-T01N-GRW (WAT127C)	X	X	X				
US-3-T01N-GRW (WAT127C)	X	X	X				
MW-24-T01N-GRW (WAT128C)	X, RB	X, RB	X, RB				
MW-25-T01N-GRW (WAT128C)	X	X	X				
MW-29-T01N-GRW (WAT128C)	X	X	X				
MW-15-T01N-GRW (WAT128C)	X, RB	X, RB	X, RB				
MW-14-T01N-GRW (WAT128C)	X, FD	X, FD	X, FD				
EW-2-T01N-GRW (WAT128C)	X	X	X				
EW-4-T01N-GRW (WAT128C)	X	X	X				
MINE1-T01N-GRW (WAT129C)	X	X	X				
P-3-T01N-GRW (WAT130A)	X, RB	X, RB	X, RB				
P-5B-T01N-GRW (WAT130A)	X	X	X				
P-5C-T01N-GRW (WAT130A)	X	X	X				
P-5A-T01N-GRW (WAT130A)	X, MS, LD	X, MS, LD	X, MS, LD				
P-4B-T01N-GRW (WAT130A)	X	X	X				
SPRING 18-T01N-GRW (WAT131C)	X, MS, LD	X, MS, LD	X, MS, LD				
SPRING 17-T01N-GRW (WAT131C)	X	X	X				
SPRING 15T-T01N-GRW (WAT131C)	X	X	X				
SPRING 14T-T01N-GRW (WAT131C)	X	X	X				
COLUMBINE CAMPGROUND WELL-T01N-GRW (WAT136C)	X	X	X				
ELEPHANT ROCK CAMPGROUND WELL-T01N-GRW (WAT136C)	X	X	X				
LAB WELL-T01N-GRW (WAT136C)	X, FD	X, FD	X, FD				
COMPANY CABIN WELL-T01N-GRW (WAT136C)	X	X	X				
FAGERQUIST WELL-T01N-GRW (WAT136C)	X	X	X				
COLUMBINE NO1-T01N-GRW (WAT137A)	X, MS, LD	X, MS, LD	X, MS, LD				
COLUMBINE NO2-T01N-GRW (WAT137A)	X	X	X				
MMW-29B-T01N-GRW (WAT140C)	X	X	X				
MMW-18B-T01N-GRW (WAT140C)	X	X	X				
MMW-40A-T01N-GRW (WAT140C)	X	X	X				
MMW-19B-T01N-GRW (WAT140C)	X	X	X				
MMW-25B-T01N-GRW (WAT140C)	X, RB	X, RB	X, RB				
SPRING 12A-T01N-GRW (WAT140C)	X	X	X				

Table 1-1
Summary of Groundwater Samples Collected During July, 2003 Sampling Event

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganic	VOCs	SVOCs	TPH	Explosives
MMW-42B-T01N-GRW (WAT140C)	X	X	X				
MMW-2-T01N-GRW (WAT144C)	X	X	X				
CHAMBER SPRING-T01N-GRW (WAT144C)	X	X	X				
MMW-3-T01N-GRW (WAT144C)	X	X	X				
MMW-44B-T01N-GRW (WAT144C)	X	X	X				
MMW-23B-T01N-GRW (WAT144C)	X	X	X				
MMW-10B-T01N-GRW (WAT144C)	X	X	X				
MMW-35B-T01N-GRW (WAT144C)	X	X	X				
MMW-13-T01N-GRW (WAT144C)	X	X	X				
MMW-43A-T01N-GRW (WAT144C)	X	X	X				
MMW-23A-T01N-GRW (WAT145A)	X	X	X				
PORTAL SPRING-T01N-GRW (WAT145A)	X	X	X				
MMW-45A-T01N-GRW (WAT145A)	X	X	X				
SPRING 14M-T01N-GRW (WAT145A)	X	X	X				
SPRING 14MA-T01N-GRW (WAT145A)	X	X	X				
CAPULIN SPRING-T01N-GRW (WAT145A)	X	X	X				
CAPULIN SPRING SOURCE-T01N-GRW (WAT145A)	X	X	X				
MMW-47A-T01N-GRW (WAT145A)	X	X	X				
GOATHILL SPRING SOURCE-T01N-GRW (WAT145A)	X	X	X				
GOATHILL SPRING-T01N-GRW (WAT146A)	X, FD	X, FD	X, FD				
MMW-28B-T01N-GRW (WAT146A)	X	X	X				
MMW-31B-T01N-GRW (WAT146A)	X	X	X				
MMW-36B-T01N-GRW (WAT146A)	X	X	X				
GWW-3-T01N-GRW (WAT146A)	X, MS, LD	X, MS, LD	X, MS, LD				
MMW-32A-T01N-GRW (WAT147A)	X	X	X				
MMW-19A-T01N-GRW (WAT147A)	X	X	X				
MMW-8B-T01N-GRW (WAT147A)	X	X	X				
WALDO SPRING-T01N-GRW (WAT147A)	X	X	X				
CABIN SPRINGS-T01N-GRW (WAT147A)	X	X	X				
MMW-31A-T01N-GRW (WAT147A)	X	X	X				
MMW-11-T01N-GRW (WAT147A)	X, RB	X, RB	X, RB				
MMW-30A-T01N-GRW (WAT147A)	X	X	X				
MMW-11A-T01N-GRW (WAT147A)	X, FD	X, FD	X, FD				
MMW-8A-T01N-GRW (WAT148C)	X	X	X				
SPRING12-T01N-GRW (WAT148C)	X	X	X				
MMW-30B-T01N-GRW (WAT148C)	X, 2 RB, FD, MS, LD	X, 2 RB, FD, MS, LD	X, 2RB, FD, MS, LD	X, FD[4], RB, FB, TB, MS, LD			X, FD, RB, FB, MS, LD
CC2A-T01N-GRW (WAT148C)	X	X	X				
CC2B-T01N-GRW (WAT148C)	X	X	X				
CC1A-T01N-GRW (WAT148C)	X	X	X				
CC1B-T01N-GRW (WAT148C)	X	X	X				
MMW-10A-T01N-GRW (WAT149A)	X	X	X				
MMW-10C-T01N-GRW (WAT149A)	X	X	X				
MMW-33A-T01N-GRW (WAT149A)	X	X	X				
MMW-49A-T01N-GRW (WAT149A)	X	X	X				
GWW-1-T01N-GRW (WAT149A)	X	X	X				
GWW-2-T01N-GRW (WAT149A)	X	X	X				

Table 1-1
Summary of Groundwater Samples Collected During July, 2003 Sampling Event

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganic	VOCs	SVOCs	TPH	Explosives
UPPER SPRING 39-T01N-GRW (WAT149A)	X	X	X				
LOWER SPRING 13-T01N-GRW (WAT149A)	X, RB	X, RB	X, RB				
SPRING 13 PUMP-T01N-GRW (WAT149A)	X	X	X				
SPRING 39 PUMP-T01N-GRW (WAT149A)	X	X	X				
MMW-28A-T01N-GRW (WAT151C)	X	X	X				
MMW-29A-T01N-GRW (WAT151C)	X	X	X				
MMW-32B-T01N-GRW (WAT151C)	X	X	X				
MMW-42A-T01N-GRW (WAT152A)	X	X	X				
MMW-34B-T01N-GRW (WAT152A)	X	X	X				
P-1-T01N-GRW (WAT152A)	X	X	X				
MMW-45B-T01N-GRW (WAT152A)	X	X	X				
MMW-27A-T01N-GRW (WAT152A)	X, MS, LD	X, MS, LD	X, MS, LD				
MMW-44A-T01N-GRW (WAT152A)	X	X	X				
P-2-T01N-GRW (WAT152A)	X	X	X				
MMW-24-T01N-GRW (WAT152A)	X	X	X				
MMW-17A-T01N-GRW (WAT152A)	X	X	X				
MMW-17B-T01N-GRW (WAT152A)	X	X	X				
MMW-21-T01N-GRW (WAT153A)	X, FD	X, FD	X, FD				
MMW-38A-T01N-GRW (WAT153A)	X	X	X				
MMW-39A-T01N-GRW (WAT153A)	X	X	X				
MMW-7-T01N-GRW (WAT153A)	X	X	X				
MMW-48A-T01N-GRW (WAT153A & WAT154C)[7]	X	X	X	X, FD[5], RB, FB, TB	X, FD, RB[6], FB	X, FD, RB, FB	
Number GW samples	147	147	147	2	1	2	1
Number MS/MSD or MS/LD	9	9	9	1	0	0	1
Number Field Duplicates	9	9	9	2	1	1	1
Number Rinsate Blanks	9	9	9	2	1	1	1
Number Field Blanks	0	0	0	2	1	1	1

NS = Not Sampled MS/MSD = Matrix Spike/Matrix Spike Duplicate NA = Not Applicable LD = Laboratory Duplicate
RB = Rinsate Blank FD = Field Duplicate FB = Field Blank GRW = Groundwater

Notes:

1 For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N."

2 Although sample collected at the DECANT location was accidentally labeled as a groundwater sample, it is actually a surface water sample which was also analyzed for Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). However, it was retained in this data set.

3 Shaded cells denote new locations sampled for the first time in July 2003.

4 Contract Laboratory Program (CLP) VOCs per RI/FS QAPP.

5 VOCs by EPA Method 8260B.

6 Polyaromatic Hydrocarbon (PAHs) by EPA Method 8270 in the selective ion monitoring mode (SIM).

7 The organic analyses conducted on this sample were specified for a non-RI/FS purpose.

Reanalyses were conducted on two samples from the July 2003 groundwater sampling event. Sample OUTFALL 002 was re-analyzed for dissolved aluminum, arsenic, and cadmium with no dilutions to achieve the lowest possible reporting limits. Sample RB05T-GRW was reanalyzed for sulfate due to a significant total vs. partial disagreement. Table 2-1 summarizes the data packages in which the original and reanalysis results are reported.

Table 2-1
Summary of Reanalysis for Groundwater August, 2003 Sampling Event

Sample ID	Data Package	Parameters Retained for Final Data Set
OUTFALL 002-T01N-GRW	WAT124C	Total and Dissolved Metals (minus dissolved aluminum, arsenic and cadmium), Inorganics
	WATRAS4	Dissolved aluminum, arsenic, and cadmium (reanalysis)
RB05T-GRW	WAT140C	Total Metals, Dissolved Metals, Inorganics (minus Sulfate)
	98732	Sulfate (reanalysis)

The results for the reanalyses were reviewed in the same fashion as the original analyses. As a result of this review, the results obtained for reanalyses were selected for reporting and the original results were superseded. The original data sheets were marked accordingly.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, Inductively Coupled Plasma (ICP) Spectroscopy serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, rinsate blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Section 4.0 comments on the data review narratives for each of the data packages. In all cases of professional judgment exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative.

After completing the review sample-specific and laboratory performance parameters in accordance with SOP 12.1, the site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. The reason for this is that site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 5.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Where applicable, the potential direction of bias (high, low, or indeterminate) has been identified and noted on the sample results sheets as H, L, or I, respectively. Section 6.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 7.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

4.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for the data packages included in this event. In order to attain the frequency requirements for laboratory performance reviews, three data package (WAT123A, WAT131C, and WAT136C) were evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

4.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identified whether findings globally affect all relevant water samples analyzed for the July 2003 Groundwater Sampling Event. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

4.2.1 Dilution Schemes/Non-Detects with Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

4.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilbria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples

due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

4.2.3 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

4.2.4 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL data package WAT123A, WAT131C, and WAT136C was used to evaluate laboratory performance criteria. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated were found to be acceptable and no additional packages for this event required assessment of laboratory performance parameters.

The site-specific matrix spike (MS) results, laboratory duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analysis, LD analyses, and the serial dilution results with the samples collected during the July 2003 sampling event.

Additional aliquots of nine groundwater samples were submitted for use in matrix QC analyses. Table 5.1 below summarizes the site-samples that were used to prepare MS samples.

Table 5-1
Field Samples Submitted for Matrix Spike

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganic	VOCs	SVOCs	TPH	Explosives
US-1-T01N-GRW	Groundwater	WAT122C	x	x	x				
MW-1-T01N-GRW	Groundwater	WAT122C	x	x	x				
MW-A-T01N-GRW	Groundwater	WAT125C	x	x	x				
P-5A-T01N-GRW	Groundwater	WAT130A	x	x	x				
SPRING 18-T01N-GRW	Groundwater	WAT131C	x	x	x				
COLUMBINE NO 1-T01N-GRW	Groundwater	WAT137C	x	x	x				
GWW-3-T01N-GRW	Groundwater	WAT146A	x	x	x				
MMW-30B-T01N-GRW	Groundwater	WAT148C	x	x	x	x			x
MMW-27A-T01N-GRW	Groundwater	WAT152A	x	x	x				

[1]For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

Table 5-2 lists the groundwater MS sample sets relative to the number of field samples.

Table 5-2
Count of Matrix Spike Samples Collected in July, 2003 Sampling Event

Analyses	Number of MS samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	9	147	16
Dissolved Metals	9	147	16
Inorganics	9	147	16
VOCs	1	2	50
SVOCs	0	1	0
TPH	0	2	0
Explosives	1	1	100

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses except for VOCs and SVOCs.

There were no MS/MSD conducted on site specific samples for the SVOC-SIM and TPH methods. Only one sample from this event was analyzed for polyaromatic hydrocarbons (PAHs) by EPA Method 8270-SIM and two samples were analyzed for total petroleum hydrocarbons (TPH-diesel range) by EPA Method 8015. In all three cases, the data use objective was non-RI/FS. The recoveries for the duplicate LCSs were used to assess accuracy and precision for

these methods for this event. Site-specific matrix QC samples have been analyzed for these methods in other events and results were found to be within acceptance limits. As such, the usability of the PAH and TPH data is not considered to be compromised by the lack of matrix QC analyses for this event.

5.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results. A number of spike recoveries were outside of the QC acceptance limits of 75-125% for both inorganics and metals. In general, if less than a quarter of the valid spike recoveries (i.e., the sample concentration was no greater than four times the spike added) for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

5.1.1 Metals and Inorganic Matrix Spike Results

Although the majority of the groundwater matrix spike recoveries were within acceptance limits, some exceedances were observed. Table 5-3 summarizes the inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added), and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 5-3
Matrix Spike Outliers and Corresponding Results Qualification for Inorganic and Metal Groundwater Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Total Metals					
Aluminum	5	0	0	110.0	
Antimony	9	0	0	99.5	
Arsenic	9	0	0	100.0	
Barium	9	0	0	101.5	
Beryllium	9	0	0	104.9	
Boron	9	0	0	104.8	
Cadmium	8	0	0	106.9	
Chromium	9	1	0	100.7	UJ/J MS-L, parent only
Cobalt	9	0	1	106.4	J MS-H, positive parent only
Copper	9	0	0	106.6	
Iron	7	0	0	111.7	
Lead	9	0	1	113.0	J MS-H, positive parent only
Manganese	5	0	0	105.8	
Mercury	9	0	0	94.5	
Molybdenum	9	0	0	104.0	
Selenium	9	1	0	89.8	UJ/J MS-L, parent only
Nickel	9	0	2	112.5	J MS-H, positive parent only

Table 5-3
Matrix Spike Outliers and Corresponding Results Qualification for Inorganic and Metal Groundwater Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Thallium	9	0	1	104.5	J MS-H, positive parent only
Silver	9	5	1	81.3	UJ/J MS-L, all results
Vanadium	9	0	0	107.1	
Zinc	6	0	0	108.3	
Dissolved Metals					
Aluminum	5	0	0	111.8	
Antimony	9	0	0	99.8	
Arsenic	9	0	0	98.6	
Barium	9	0	0	100.5	
Beryllium	9	0	0	104.1	
Boron	9	0	0	104.1	
Cadmium	9	0	1	107.3	J MS-H, positive parent only
Chromium	9	1	0	101.6	UJ/J MS-L, parent only
Cobalt	9	0	1	108.5	J MS-H, positive parent only
Copper	9	1	0	111.8	UJ/J MS-L, parent only
Iron	8	0	0	112.6	
Lead	9	0	0	106.5	
Manganese	5	0	0	106.0	
Mercury	9	0	0	93.6	
Molybdenum	9	0	0	99.8	
Selenium	9	3	0	96.7	UJ/J MS-I, all samples
Nickel	9	0	1	107.5	J MS-H, positive parents only
Thallium	9	0	1	103.6	J MS-H, positive parents only
Silver	9	5	1	79.7	UJ/J MS-L, all results
Vanadium	9	0	0	103.1	
Zinc	6	0	0	106.7	
Inorganics					
Chloride	9	0	1	105.5	J MS-H, positive parent only
Nitrate	9	0	0	101.9	
Total Alkalinity	6	0	0	102.2	
Fluoride	9	0	0	101.9	
Ammonia	9	3	0	77.0	UJ/J MS-L, all results
TKN	9	1	0	91.1	UJ/J MS-L, parent only
Nitrite	9	1	0	90.0	UJ/J MS-L, parent only
Ortho-P	9	1	0	87.8	UJ/J MS-L, parent only
Phosphorus	9	0	0	99.3	
Sulfate	9	6	0	73.9	UJ/J MS-L, all results
TOC	9	3	1	92.4	UJ/J MS-I, all results
Cyanide	9	5	0	65.9	UJ/J MS-L, all results

[1]Laboratory spiking concentration was above applicable levels. Therefore, recovery data were not used to assess the accuracy of the remaining sample results.

[2]MS recoveries for the bicarbonate and total alkalinity analyses are not an appropriate measure of accuracy due to the highly variable pH range (see Section 3.2.2). Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not used to assess the accuracy of the analysis.

For seven of the analytes listed in the tables above, it was considered necessary to extend qualification to the balance of the July 2003 groundwater samples because more than a quarter of

the spike results were outside evaluation criteria. The vast majority (89.8%) of matrix spike results were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

5.1.2 Post-Digestion Spikes

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the matrix spike exceedances were the result of sample matrix, and/or due to a bias in the analytical system. Recoveries for nearly all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

5.1.3 Organic Matrix Spike Results

The percent recovery of the MS and MSD results for target analytes contained in the spiking solutions used by the laboratory were within QAPP acceptance limits. Table 5-4 summarizes the organic MS and MSD results, including the average percent recovery, the number of high and low exceedances, the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added), and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 5-4
Matrix Spike/ Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Organic Groundwater Samples

Analyte	No. of Valid Spikes	Recoveries < LCL	Recoveries > UCL	Average %R	Action
Explosives-MS and MSD					
HMX (83-122)	2	0	0	82	
RDX (81-116)	2	2	0	58	UJ/J MS-L, parent only
2,4,6-Trinitrotoluene (75-106)	2	0	0	107	
PETN (75-110)	2	2	0	50	UJ/J MS-L, parent only
PYX (70-130)	2	2	0	0	R MS-L, parent only
VOC-MS and MSD					
1,1-Dichloroethene (67-145)	2	0	0	105	
Benzene (76-127)	2	0	0	106	
Trichloroethene (70-120)	2	0	0	106	
Toluene (76-125)	2	0	0	93	
Chlorobenzene (75-130)	2	0	0	105	

LCL = Lower Control Limit UCL = Upper Control Limit

For a few of the explosive analytes listed in the table above, the qualification was only applied to the parent sample MMW-30B-T01N-GRW, which was the only sample analyzed for explosives. All of the spiked VOC analytes were recovered within the acceptable ranges; therefore, no qualification was necessary.

5.2 LABORATORY DUPLICATES (PRECISION EVALUATION)

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion of ≤20% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

The samples listed in Table 5-1 were also used for laboratory duplicate or spiked duplicate analyses.

5.2.1 Metal and Inorganic Laboratory Duplicates

Most laboratory duplicate results were within the laboratory acceptance limits. Table 5-5 below lists the groundwater laboratory duplicate results exceeding criteria and the result qualifiers applied.

Table 5-5
Laboratory Duplicate Exceedances for Groundwater Samples

Analyte (20% or 1xRL)	Sample ID	RPD or ADF	Frequency of Limit Exceedance	Action
Metals				
Chromium	US-1-T01N-GRW	AD = 69 x CRDL	1 of 9	J D-I for parent sample results
Inorganic				
TDS	GWW-3T01N-GRW	RPD= 31%	1 of 9	J D-I for parent sample results
Fluoride	MW-1-T01N-GRW	RPD= 46%	1 of 9	J D-I for parent sample results

AD = Absolute Difference.

The laboratory duplicate results indicate overall acceptable precision. The chromium result for the parent sample US-1-T01N-GRW, the TDS result for parent sample GWW-3-T01N-GRW, and the fluoride result for parent sample MW-1-T01N-GRW were qualified as estimated on the basis of laboratory duplicate results.

5.2.2 Organic Spikes Duplicate Results

For VOCs and Explosives, the duplicate spikes were conducted on field samples. For SVOCs and TPH, the duplicate spikes were conducted on laboratory control samples because there were no site-specific samples used for matrix QC for this even as discussed earlier in Section 5. All of the organic (VOCs, SVOCs, TPH, and Explosives) spiked duplicate results were within the laboratory acceptance limits. Therefore, no qualifications were needed.

5.3 SERIAL DILUTION RESULTS

ICP serial dilutions are analyzed to help evaluate whether or not interferences exist due to sample matrix. When analyte concentrations are sufficiently high (defined as minimally 50x greater than the instrument detection limit [IDL]), the original results and five fold dilution are expected to agree within 10%. Otherwise interferences resulting in signal suppression or enhancement might be suspected.

The original and diluted sample results are compared by a percent difference (%D). When %Ds of ≤10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate than the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result.

In general, qualification was limited to the parent sample if fewer than a quarter of the applicable serial dilution results were outside the acceptance range. Conversely, if more than a quarter of the applicable serial dilution results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average %D, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

Table 5-6 lists the number of applicable groundwater serial dilution results for analytes that exceeded criteria. With the exceptions noted in the table, all remaining %Ds between the original sample results and the result obtained from a five-fold diluted sample were ≤10%.

Table 5-6
ICP Serial Dilution Exceedances for Groundwater Samples

Analyte	Number of Serial Dilution Samples Analyzed	Number of Valid Results	%Ds >10%	Avg. %Ds	Potential Bias Direction		Action
					Low	High	
Total Antimony	24	5	1	6.4	1	0	UJ/J DL-L, parent (MMW-30B) results only
Total Beryllium	24	8	2	6.4	2	0	UJ/J DL-L, parent (MINE1 and COLUMBINE NO1) sample results only
Total Manganese	24	13	1	2.9	0	1	UJ/J DL-H, parent (SPRING 18) results only
Total Potassium	24	1	1	37.0	1	0	UJ/J DL-L, parent (EASTSEEP) results only
Total Vanadium	24	5	2	8.2	2	0	UJ/J DL-H, parent (US-1 and MW-1) sample results only
Dissolved Arsenic	9	4	1	6.2	1	0	UJ/J DL-L, parent (Spring 18) result only
Dissolved Beryllium	9	6	2	6.2	2	0	UJ/J DL-L, parent (P-5A and COLUMBINE NO1) sample results only
Dissolved Chromium	9	4	1	5.2	0	1	UJ/J DL-H, parent (US-1) result only
Dissolved Manganese	9	7	2	5.0	1	1	UJ/J DL-I, parent (P-5A and SPRING 18) sample results only

The vast majority (>93%) of serial dilution results were within acceptance limits. The few samples that were qualified were limited to the parent sample results for the following reasons:

- Although a third of the applicable results for total and dissolved beryllium were out, in both cases one exceedance was marginally out (i.e., 12.4% and 11.2%, respectively) and the other samples (15.8% and 18.0%, respectively) were not considered representative of the trend as the average %Ds were quite low (6.4% and 6.2%). As such, qualification was limited to the parent samples.
- Although more than a quarter of the dissolved manganese and total vanadium applicable serial dilution results were out, the exceedances were marginal (less than 15%) and the average %D were less than 10%. As such, qualification was limited to the parent samples.
- For total antimony, total manganese, dissolved arsenic, and dissolved chromium, qualification was limited to the parent sample because only one result was out and the average %D was <10%.
- For potassium, qualification was limited to the parent sample only because only one of the 24 serial dilution results was applicable for assessing potential interference problems. One data point was considered too small to represent 147 groundwater samples. Furthermore, having only one applicable result out of 24 indicates that native sample concentrations were generally lower than 50x IDL such that matrix interferences would be expected to be minimal.

The site-specific blanks (field and rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. Field duplicate agreement was assessed to determine the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. The following sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

6.1 FIELD DUPLICATE SAMPLES

Nine field duplicate sample pairs were collected during this sampling event. The field duplicate pairs and frequencies are listed in the Table 6-1 and 6-2 below. As there were 147groundwater samples, the frequency of field duplicate collection satisfied the QAPP requirement of 5%.

Table 6-1
Summary of Field Duplicate Water Samples Collected Summer 2003

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	VOCs	SVOCs	TPH	Explosives
EW-5A-T01N-GRW/ EW-5A-T01D-GRW	Groundwater	WAT125C	X	X	X				
MW-20-T01N-GRW/ MW-20-T01D-GRW	Groundwater	WAT126C	X	X	X				
MW-12-T01N-GRW/MW-12-T01D-GRW	Groundwater	WAT126C	X	X	X				
MW-14-T01N-GRW/MW-14-T01D-GRW	Groundwater	WAT128C	X	X	X				
LABWELL-T01N-GRW/LABWELL-T01D-GRW	Groundwater	WAT136C	X	X	X				
GOATHILL SPRING-T01N-GRW/GOATHILL SPRING T01D-GRW	Groundwater	WAT146A	X	X	X				
MMW-11A-T01N-GRW/MMW-11A-T01D-GRW	Groundwater	WAT147A	X	X	X				
MMW-30B-T01N-GRW/MMW-30B-T01D-GRW	Groundwater	WAT148C	X	X	X	X			X
MMW-21-T01N-GRW/MMW-21-T01D-GRW	Groundwater	WAT153A	X	X	X				

[1] For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

Table 6-2
Field Duplicate Collection Frequency for the July, 2003 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	9	147	16
Dissolved Metals	9	147	16
Inorganics	9	147	16
VOCs	1	2*	50
SVOCs	0	1	0
TPH	0	1	0
Explosives	1	1	100

*One sample was analyzed by the CLP methodology where as the other was analyzed by Method 8260B, for a non-RI/FS purpose.

With the exceptions of VOCs and SVOCs, the QAPP frequency requirement of 5% for field duplicates was satisfied.

There were no field duplicate samples analyzed for the SVOC-SIM and TPH methods. Only one sample from this event was analyzed for VOCs by Method 8260B and polyaromatic hydrocarbons (PAHs) by EPA Method 8270-SIM, and two samples were analyzed for total petroleum hydrocarbons (TPH-diesel range) by EPA Method 8015. In all three cases, the data use objective was non-RI/FS. The recoveries for the duplicate LCSs were used to assess accuracy and precision for these methods for this event. Site-specific field duplicate samples have been analyzed for these methods in other events and results were found to be within acceptance limits. As such, the usability of the VOCs by Method 8260B, PAH, and TPH data is not considered to be compromised by the lack of field duplicate sample analyses for this event.

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion of ≤25% was applied for cases in which both the sample and sample duplicate concentration were greater than two times the RL as the reporting limit. For field duplicate pairs where the sample or duplicate concentration was less than five times the reporting limits, the absolute difference between the sample and duplicate was compared to the criterion of two times the greater RL. With few exceptions, the applicable evaluation criterion was met. The exceptions and the resultant data qualifiers are summarized in the Table 6-3 below.

Table 6-3
Field Duplicate Exceedances for Groundwater Samples

Sample ID	Analyte	RPD or ADF	Comment	Action
Metals				
GOATHILL SPRING-T01N-GRW GOATHILL SPRING-T01D-GRW	Total Mercury	AD = 8 x CRDL	1 of 9	J FD-I parent sample
Inorganics				
MMW-11A-T01N-GRW MMW-11A-T01D-GRW	TSS	AD = 37 x RL	1 of 9	J FD-I parent sample

AD = Absolute Difference

Data qualification for all of the field duplicates results were limited to the parent samples only because of the relatively minimal frequency and magnitude of the exceedances. The parent sample results were qualified as estimated with an indeterminate bias (J FD-I).

Although some results were qualified based on field duplicate agreement, the vast majority (>99%) of the field duplicate results were within limits.

6.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blanks are prepared in an identical manner to the samples with which they are associated. Rinsate blank samples were prepared by pouring ASTM Type II water or laboratory supplied “reagent-free” water over decontaminated sampling equipment and collecting the water in appropriate sample containers. In the case of groundwater rinsate blanks, the water was run through the decontaminated sampling pump. Tables 6-4 and 6-5 summarize the rinsate blank samples associated with the

samples collected during the July 2003 Groundwater sampling event. The QAPP required frequency of 5% for the collection of rinsate blanks was met for the July 2003 sampling event.

Table 6-4
Rinsate Blanks Collected During the July, 2003 Sampling Event

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	VOCs	SVOCs	TPH	Explosives
RB08T-GRW	Groundwater	WAT125C	X	X	X				
RB04T-GRW	Groundwater	WAT128C	X	X	X				
RB06T-SFW	Groundwater	WAT128C	X	X	X				
RB07T-GRW	Groundwater	WAT128C	X	X	X				
RB05T-GRW	Groundwater	WAT140C	X	X	X				
RB03T-GRW	Groundwater	WAT148C	X	X	X				
RB01T-GRW	Groundwater	WAT148C	X	X	X	X			X
RB09T-GRW	Groundwater	WAT151C	X	X	X				
RB02T-GRW	Groundwater	WAT151C	X	X	X				
RB10T-GRW	Groundwater	WAT154C				X	X	X	

[1]The "T" in the field ID was changed to "D" for dissolved metals samples.

Table 6-5
Rinsate Blank Collection Frequency for the July, 2003 Sampling Event

Analyses	Number of RB samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	9	147	16
Dissolved Metals	9	147	16
Inorganic	9	147	16
VOCs	2	2	100
SVOCs	1	1	100
TPH	1	2	50
Explosives	1	1	100

The rinsate blank detections results for groundwater and the resulting data qualification issued are summarized in Tables 6-6. To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result which might bias the average low or biasing the average high by using the reporting limit. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 6-6
Summary of Groundwater Rinsate Blank Results and Additional Qualifications

Analyte	Sample ID	Conc.	RL	Average Conc.	Frequency of Detection	Range of Field Samples		Action[1]
						min	max	
Total Metals								
Calcium	RB02T-GRW	2,510	2,230	1270	1 of 9	2,940	769,000	Calcium results <6,350 mg/l were qualified as U RB-I.
Chromium	RB09T-GRW	0.75	0.6	0.35	1 of 9	0.6	612	Chromium results <1.75 mg/l were qualified as U RB-I
Copper	RB01T-GRW	5.3	1.4	1.211	1 of 9	1.4	9,250	Copper results <6.06 mg/l were qualified as U RB-I
Lead	RB08T-GRW	0.87	0.2	0.185	1 of 9	0.2	1,660	Lead results <0.925 mg/l were qualified as U RB-I
Manganese	RB02T-GRW	17.8	7	8.9	2 of 9	7	601,000	Manganese results <44.5 mg/l were qualified as U RB-I
	RB03T-GRW	41.3	19					
Zinc	RB08T-GRW	16.3	16	8.95	1 of 9	10	126,000	Zinc results <44.75 mg/l were qualified as U RB-I.
Inorganics								
Ammonia	RB04T-GRW	0.28	0.04	0.071	3 of 9	0.04	2.4	Ammonia results <0.355 mg/l were qualified as U RB-I
	RB05T-GRW	0.17						
	RB08T-GRW	0.07						
Total Alkalinity and Bicarbonate Alkalinity	RB01T-GRW	2.5	1	3.02	9 of 9	1	682	Bicarbonate results <15.1 mg/l were qualified as U RB-I
	RB02T-GRW	2.9						
	RB03T-GRW	2.9						
	RB04T-GRW	3						
	RB05T-GRW	3.3						
	RB06T-GRW	3.7						
	RB07T-GRW	3						
	RB08T-GRW	2.9						
	RB09T-GRW	3						
Phosphate, Ortho As P	RB08T-GRW	0.068	0.01	0.012	1of 9	0.01	16.9	Phosphorus results <0.06 mg/l were qualified as U RB-I
Sulfate	RB08T-GRW	6.2	5	2.96	2 of 9	9.2	14,900	Sulfate results <14.8 mg/l were qualified as U RB-I
	RB09T-GRW	3						
TDS	RB01T-GRW	30	10	28	7 of 7	78	27,900	TDS results <140 mg/l were qualified as U RB-I.
	RB02T-GRW	24						
	RB04T-GRW	10						
	RB05T-GRW	38						
	RB06T-GRW	30						
	RB07T-GRW	56						
	RB08T-GRW	8						
	RB03T-GRW	R						
	RB09T-GRW	R						
TOC	RB07T-GRW	2.1	1	0.733	2 of 9	1	52.2	TOC results <3.67 mg/l were qualified as U RB-I.
	RB09T-GRW	1						
TSS	RB03T-GRW	0.8	0.5	0.516	4 of 9	0.5	1,100	TSS results <2.58 mg/l were qualified as U RB-I.
	RB04T-GRW	0.5						
	RB05T-GRW	1.5						
	RB06T-GRW	0.6						
Organics								
Acetone	RB01T-GRW	4	10	3	2 of 2	1.6	710	Acetone results <15 mg/l were qualified as U RB-I
	RB10T-GRW	2	5					
Chloroform	RB10T-GRW	0.52	1	0.51	1 of 2	1	59	Chloroform results <2.55 mg/l were qualified as U RB-I

ND = Nondetect MDL = Method Detection Limit RL = Reporting Limit

[1]Criteria for qualification was based on 5x the average concentration found in the rinsate blanks.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

6.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field blanks are generated by pouring laboratory-supplied reagent grade water into certified pre-cleaned sample containers, at the sample collection site. Tables 6-7 and 6-8 summarize the field blank samples associated with the samples collected during the July 2003 Groundwater sampling event. Field blanks are only required to be collected by the project QAPP when samples are analyzed for organics.

Table 6-7
Field Blanks Collected During the July, 2003 Sampling Event

Sample ID	Matrix	Data Package	VOCs	SVOCs	TPH	Explosives
FB01T-GRW	Groundwater	WAT148C	X			X
FB02T-GRW	Groundwater	WAT154C	X	X	X	

Table 6-8
Field Blank Collection Frequency for the July, 2003 Sampling Event

Analyses	Number of FB samples	Total Organic Samples	Percentage (%)
Groundwater			
VOCs	2	2	50
SVOCs	1	1	100
TPH	1	2	50
Explosives	1	1	100

Although there were a few minor detections in the VOC and SVOC groundwater field blank results, all of the associated field sample results were non-detect. Therefore, no qualification was necessary. Furthermore, all of the explosive and TPH groundwater field blank results were non-detect. No qualifications of data were necessary.

With the exception of six results, all results for field samples are considered usable as qualified. The PYX, nitrite, total selenium, and dissolved selenium results for sample MMW-30B-T01N-GRW were rejected due to severely low matrix spike recoveries. Similarly, the total and dissolved silver results for MMW-27A-T01N-GRW were rejected due to severely low matrix spike recoveries. Some sample results were qualified as nondetect on the basis of laboratory or rinsate blank contamination. In addition, some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summaries. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

7.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate (matrix spike duplicate) results. Table 7-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 7-1
Summary of Precision Assessment for July 2003

Analysis Type	QC Measure	# of Analytes Measured	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	FD	171	170	99.4
	LD	171	169	98.3
Total metals	FD	225	224	99.6
	LD	225	224	99.6
Dissolved Metals	FD	225	224	99.6
	LD	225	225	100
VOCs	FD	146	146	100
	MS/MSD	5	5	100
SVOCs	FD	25	25	100
	MS/MSD	0	NA	NA
TPH	FD	2	2	100
	MS/MSD	0	NA	NA
Explosives	FD	5	5	100
	MS/MSD	5	5	100

With greater than 95% of all precision measurements satisfying evaluation criteria, the overall level of precision attained for this sampling event is considered to be acceptable.

7.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the

more accurate the measurement. Percent of MS (and MSD) recoveries meeting criteria are summarized in Table 7-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters.

Table 7-2
Summary of Accuracy Assessment for July 2003

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	MS	105	83	79.0
Total Metals	MS	175	162	92.6
Dissolved Metals	MS	177	162	91.5
VOCs	MS and MSD	10	10	100
SVOCs	MS and MSD	NA	NA	NA
TPH	MS and MSD	NA	NA	NA
Explosives	MS and MSD	10	4	40

In general, the overall level of accuracy attained is considered to be acceptable for the metals, inorganics, and VOCs. However, the same assertion cannot be made for explosives. Only one sample was analyzed for explosives and the results were qualified accordingly.

7.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

There were 147 groundwater samples collected during the July 2003 sampling event. All samples yielded valid results for all target analytes with the exception of the six results mentioned earlier in this section. Consequently, the overall completeness achieved for the field sample was 99.9%.

7.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the groundwater samples collected during the July 2003 sampling event. The close agreement between the field duplicate results, as discussed in Section 6.1, indicated that the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates,

noted in Section 5.2 indicated that sample processing and subsampling procedures were acceptable.

7.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

7.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. As such, obtaining some nondetect results with elevated reporting limits was not avoidable. While it is anticipated that all data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT122C

Sampling Event: July 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 08/22/03

Peer Reviewer: Stacey Coker

Date Completed: 08/25/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation(2)	Matrix	Analyses				
					Metals	Inorganics	DRO	BOD_5	COD
US-1-T01N-GRW	SA	533247		W	X	X			
US-1-D01N-GRW	SA	533248		W	X				
SPRING9-T01N-GRW	SA	533324		W	X	X			
SPRING9-D01N-GRW	SA	533325		W	X				
OUTFALL002PIPE-T01N-GRW	SA	533326	OUTFA2PIPE-T01N-GRW	W	X	X			
OUTFALL002PIPE-D01N-GRW	SA	533327	OUTFA2PIPE-D01N-GRW	W	X				
LS-3-T01N-GRW	SA	533328		W	X	X			
LS-3-D01N-GRW	SA	533329		W	X				
LS-1-T01N-GRW	SA	533330		W	X	X			
LS-1-D01N-GRW	SA	533331		W	X				
MW-1-T01N-GRW[3]	SA	533332		W	X	X			
MW-1-D01N-GRW[3]	SA	533333		W	X				
LS-2-T01N-GRW	SA	533334		W	X	X			
LS-2-D01N-GRW	SA	533335		W	X				
SPRING9A-T01N-GRW	SA	533336		W	X	X			
SPRING9A-D01N-GRW	SA	533337		W	X				
SPRING10-T01N-GRW	SA	533338		W	X	X			
SPRING10-D01N-GRW	SA	533339		W	X				
DECANT-T01N-GRW	SA	533340	ECANTTO1NGRW	W	X	X	X	X	X
DECANT-D01N-GRW	SA	533341		W	X				

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

[3]Additional volume submitted for matrix QC analyses.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The anion/cation balances for samples LS-2-T/D01N-GRW and SPRING10-T/D01N-GRW exhibited elevated anion results; sulfate was suspected as contributing primarily to this imbalance. The sulfate analyses were re-performed outside the analytical holding time of 28 days; the results for the re-analyses yielded acceptable anion/cation balance calculations. As such, the sulfate results for the re-analyses were reported and accordingly qualified as estimated (J), on the basis of holding time.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	According to the laboratory log-in sheet, the chain of custody erroneously listed samples SPRING10-T/D01N-GRW as SPRING10A-T/D01N-GRW. No data qualification was necessary and completeness was not affected by this inadvertent error on the COC form.
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for the samples received on 07/10/03 were accomplished one day beyond the prescribed analytical holding time of 48 hours due to a malfunction of the IC instrument autosampler device. Accordingly, nitrate results for affected samples were qualified as estimated (J/UJ). The 48-hour holding times for the majority of nitrite and orthophosphate samples were exceeded by several hours. Accordingly, analyses run outside of the holding time were qualified as estimated (J/UJ). The BOD_5 analysis for the DECANT sample was performed one day beyond the analytical holding time of 48 hours and was accordingly qualified as estimated (J). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken nine days after sampling and seven days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.
Matrix QC • MS/MSD US-1-T01N-GRW MW-1-T01N-GRW • PDS • LD US-1-T01N-GRW US-1-D01N-GRW	No	Matrix spike and laboratory duplicate analyses were conducted on two samples. Two matrix spike results and two laboratory duplicate results were outside acceptance limits. Tables 1.3 and 1.4 summarize these results and the data qualification issued. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (C) US-1-T01N-GRW MW-1-T01N-GRW US-1-D01N-GRW MW-1-D01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	No	Serial dilution tests were conducted on four samples. For each sample, the serial dilution results could be used to assess potential interferences for 5 or 6 of the 24 metals analyzed by ICP. Table 1.5 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The results for multiple analytes were qualified as (J/UJ) on the basis of total versus partial disagreement and assigned a qualifier code of "TvP" with an indeterminate bias direction. If both analyte concentrations per sample couple (dissolved/total) were greater than 5x the RL (adjusted for dilution), the Relative Percent Difference (RPD) was compared to an evaluation criterion of ≤30%. When one or both of the analyte concentrations for the sample couple were not greater than 5x the RL (adjusted for dilution), the absolute difference between the two results was compared to an evaluation criterion of 2x the RL (adjusted for dilution). Table 1.6 summarizes the results qualified along with the concentrations reported. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No field QC samples were analyzed with this data package. The field QC results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH	BOD_5	Sulfate
US-1-T01N-GRW	---	---	---	253 J	7.0 J	---	---
SPRING9-T01N-GRW	0.63 J	---	0.033 J	869 J	7.2 J	---	---
OUTFALL002PIPE-T01N-GRW	0.40 UJ	0.0050 UJ	0.053 J	1520 J	7.4 J	---	---
LS-3-T01N-GRW	0.40 UJ	---	---	431 J	6.6 J	---	---
LS-1-T01N-GRW	0.65 J	---	---	433 J	6.7 J	---	---
MW-1-T01N-GRW	1.3 J	0.0050 UJ	0.015 J	918 J	7.4 J	---	---
LS-2-T01N-GRW	0.40 UJ	---	---	441 J	6.6 J	---	176 J
SPRING9A-T01N-GRW	1.4 J	0.0050 UJ	0.047 J	863 J	7.3 J	---	---
SPRING10-T01N-GRW	0.52 J	0.0050 UJ	0.021	576 J	7.6 J	---	180 J
DECANT-T01N-GRW	0.40 UJ	0.013 J	0.010 UJ	2410 J	7.7 J	2.4 J	---

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P)	-0.4	-0.6	-0.8	---	---	---	0.2	All samples	UJ CCB-I J CCB-I
Boron (P)	6.8	5.0	12.2	---	---	8.292	4.6	All samples with the **exception of:** SPRING10-D01N-GRW SPRING10-T01N-GRW	U MB,CCB-I U MB-I
Chromium (P)	-0.9	-1.2	-1.3	---	---	-1.059	0.6	All samples with the **exception of:** US-1-D01N-GRW	UJ MB,CCB-L J MB,CCB-L
Copper (P)	---	---	---	---	---	1.902	1.4	DECANT-T01N-GRW LS-1-D01N-GRW LS-2-D01N-GRW LS-3-D01N-GRW LS-3-T01N-GRW MW-1-D01N-GRW MW-1-T01N-GRW SPRING10-D01N-GRW SPRING10-T01N-GRW SPRING9A-D01N-GRW SPRING9A-T01N-GRW SPRING9-D01N-GRW SPRING9-T01N-GRW US-1-D01N-GRW US-1-T01N-GRW	U MB-I
Zinc (P)	---	---	---	---	---	2.134	1.6	DECANT-D01N-GRW DECANT-T01N-GRW LS-1-T01N-GRW LS-2-D01N-GRW LS-3-D01N-GRW LS-3-T01N-GRW MW-1-D01N-GRW MW-1-T01N-GRW OUTFALLPIPE002-D01N-GRW OUTFALLPIPE002-T01N-GRW SPRING9A-T01N-GRW SPRING9-D01N-GRW SPRING9-T01N-GRW US-1-D01N-GRW US-1-T01N-GRW	U MB-I

M = ICP-MS P = ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

For the sake of brevity, the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Comment	Action
US-1-T01N-GRW					
Sulfate	64.6	NA	75-125%	NONE	J MS-L parent
MW-1-T01N-GRW					
Sulfate	73.8	NA	75-125%	NONE	J MS-L parent
US-1-D01N-GRW					
Chromium	70.6	99.7	75-125%	NONE	J MS-L parent

NA = Not appropriate

Table 1.4
Laboratory Duplicate Results And Parent Sample Qualifications

Analyte	Result (mg/L)	Duplicate (mg/L)	RL* (mg/L)	Criterion	Qualification
MW-1-T01N-GRW					
Fluoride	0.35	0.56	0.010	RPD > 25	J D-I
US-1-D01N-GRW					
Chromium	70.32 (µg/L)	0.6 U (µg/L)	10 (µg/L)	Diff > 1xRL	J D-I

*CRDL used in place of the RL for metal analytes

Table 1.5
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification
US-1-T01N-GRW		
Vanadium	15.0	UJ DL-H
US-1-D01N-GRW		
Chromium	12.0	J DL-H
MW-1-T01N-GRW		
Vanadium	13.7	J DL-H

Table 1.6
Total vs. Partial Qualifications

Sample	Analyte	Dissolved (µg/L)	Total (µg/L)	Adjusted RL (µg/L)	Evaluation Criterion	Qualification Code
LS-1-T/D01NGRW	Zinc	177	57.2 (U)	57.2	≥ ±2x RL	J TvP-I or UJ TvP-I
US-1-T/D01N-GRW	Chromium	70.3	0.60 (U)	0.60	≥ ±2x RL	
MW-1-T/D01N-GRW	Chromium	2.2	0.60 (U)	0.60	≥ ±2x RL	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT123A Sampling Event: July 2003

Matrix: Solid _____ Water X Biota _____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Ansley Watson Date Completed: 08/20/03

Peer Reviewer: Stacey Coker/Alan Robert Date Completed: 10/14/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganics
DOUGLASWELL-T01N-GRW	SA	533251		W	X	X
DOUGLASWELL-D01N-GRW	SA	533252		W	X	

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 28-day holding time was exceeded by 2 days for fluoride. The analysis for pH and conductivity were exceeded by 2 and 9 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	No	Aluminum, boron, cadmium, chromium, copper, iron, mercury, molybdenum, and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. For results qualified as nondetect based on positive blank values, the reported value becomes the "effective" RL.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution DOUGLASWELL-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution test for sample DOUGLASWELL-T01N-GRW was applicable for 1 of the 24 metals. The serial dilution results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification issued will be summarized in the overall assessment. The manganese results for samples DOUGLASWELL-D01N-GRW and DOUGLASWELL-T01N-GRW were qualified as estimated (J/UJ TVP-I) because the dissolved manganese result was greater than the total manganese result.
Field QC Field Duplicate Rinsate Blank Field Blank Trip Blank Other (e.g., splits)	NA	This package did not include any site-specific field quality control samples. The field quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.
Laboratory Performance Parameters	Complete with "Yes", "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	The high standard of nitrate dropped on some ICALs, however all samples were within the range of the calibration curve.
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	Information regarding the mass resolution is not available due to software limitations. However, acceptable mass resolution can be inferred from the other QC sample results which satisfied evaluation criteria.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH	Fluoride (mg/L)
DOUGLASWELL-T01N-GRW	620 J	5.2 J	9.1 J

Table 1.2
Blank Detections Resulting in Data Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Chromium (P) DF=10	-0.8	---	---	0.6	DOUGLASWELL-T01N-GRW, DOUGLASWELL-D01N-GRW	UJ CCB-L
Mercury (CV) DF=1	-0.1	---	---	0.1	DOUGLASWELL-T01N-GRW, DOUGLASWELL-D01N-GRW	UJ CCB-L
Sodium (P) DF=10	342.9	472.4	582.9	218.8	DOUGLASWELL-T01N-GRW, DOUGLASWELL-D01N-GRW	U CCB, MB-I

CV = Cold Vapor P = ICP CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT124C

Sampling Event: July 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 08/14/03

Peer Reviewer: Stacey Coker

Date Completed: 08/18/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[(2)]	Matrix	Analyses	
					Metals	Inorganics
EASTSEEP-T01N-GRW	SA	533342		W	X	X
EASTSEEP-D01N-GRW	SA	533343		W	X	
OUTFALL002-T01N-GRW	SA	533344		W	X	X
OUTFALL002-D01N-GRW	SA	533345		W	X	
EMBARGOROADSEEP-T01N-GRW	SA	533346	EMBRDSEEP-T01N-GRW	W	X	X
EMBARGOROADSEEP-D01N-GRW	SA	533347	EMBRDSEEP-D01N-GRW	W	X	
MW-B-T01N-GRW	SA	533348		W	X	X
MW-B-D01N-GRW	SA	533349		W	X	
MW-4-T01N-GRW	SA	533350		W	X	X
MW-4-D01N-GRW	SA	533351		W	X	
MW-23-T01N-GRW	SA	533352		W	X	X
MW-23-D01N-GRW	SA	533353		W	X	
003WESTSEEP-T01N-GRW	SA	533354	003WESTSEEP-T01N-GR	W	X	X
003WESTSEEP-D01N-GRW	SA	533355	003WESTSEEP-D01N-GR	W	X	
003EASTSEEP-T01N-GRW	SA	533356	003EASTSEEP-T01N-GR	W	X	X
003EASTSEEP-D01N-GRW	SA	533357	003EASTSEEP-D01N-GR	W	X	
EW-5D-T01N-GRW	SA	533497		W	X	X
EW-5D-D01N-GRW	SA	533498		W	X	
EW-1-T01N-GRW	SA	533499		W	X	X
EW-1-D01N-GRW	SA	533500		W	X	

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The sample preservation document noted that upon log-in, sample MW-4-T01N-GRW for the analysis of hardness and metals, was received with a pH greater than 2 and subsequently required the addition of HNO_3^- to attain the proper pH for preservation. No qualification was necessary for the metal results for this sample due to the fact that the nitric acid added would have dissolved most of the metals that might have precipitated out. This was further supported by the observation that the dissolved metal concentrations are comparable to the total metal concentrations. No data qualification was necessary and completeness was not affected.
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for all samples were accomplished two days beyond the prescribed analytical holding time of 48 hours due to a malfunction of the IC instrument autosampler device. Accordingly, all nitrate results for all samples were qualified as estimated (J/UJ). In addition, the laboratory notes, the reanalysis run on 07/15/03 (pertaining to samples EW-D-T01N-GRW and EW-1-T01N-GRW) experienced issues with the instrument which resulted in the shifting of retention times in the closing check standard (CCV#4). This led to the misidentification of anions. During the data review process, the laboratory identified the anions manually and yielded acceptable percent recoveries for QC samples. The laboratory reanalyzed these two samples on 07/28/03 and attained results which confirmed those from 07/15/03. Accordingly, the laboratory presented the results from 07/15/03. This did not adversely affect the quality of data, and as such, no qualification was considered necessary. The 48-hour holding times for nitrate, nitrite, and orthophosphate were exceeded by several hours for several samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken six/eight days after sampling and four/six days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (C) EASTSEEP-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis on sample MMW-48A-T01N-GRW was not applicable for 22 of the 24 metal analytes, as the initial sample results for only two analytes were sufficiently larger (x50) than the IDL, (adjusted for dilution). The percent differences (%Ds) between the initial sample results and the serial dilution results (5x) were compared to an evaluation criteria of ±10% for the two analytes. All reported %Ds were less than 10%. It was therefore not necessary to qualify any results on the basis of serial dilution. The results for multiple analytes were qualified as (J/UJ) on the basis of total versus partial disagreement and assigned a qualifier code of "TvP" with an indeterminate bias direction. If both analyte concentrations per sample couple (dissolved/total) were greater than 5x the RL (adjusted for dilution), the Relative Percent Difference (RPD) was compared to an evaluation criterion of ≤30%. When one or both of the analyte concentrations for the sample couple were not greater than 5x the RL (adjusted for dilution), the absolute difference between the two results was compared to an evaluation criterion of 2x the RL (adjusted for dilution). Table 1.3 summarizes the results qualified along with the concentrations reported. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No field QC samples were analyzed with this data package. The field QC results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH
EASTSEEP-T01N-GRW	0.40 UJ	---	---	1960 J	7.4 J
OUTFALL002-T01N-GRW	0.20 UJ	---	---	1490 J	7.5 J
EMBARGOROADSEEP-T01N-GRW	0.30 J	---	---	1350 J	7.4 J
MW-B-T01N-GRW	0.40 UJ	---	---	1460 J	7.4 J
MW-4-T01N-GRW	0.58 J	0.0050 UJ	0.014 J	229 J	7.9 J
MW-23-T01N-GRW	0.99 J	---	0.015 J	427 J	7.9 J
003WESTSEEP-T01N-GRW	0.67 J	---	---	2720 J	7.3 J
003EASTSEEP-T01N-GRW	0.20 UJ	---	---	2080 J	7.8 J
EW-5D-T01N-GRW	0.40 UJ	---	---	1890 J	7.2 J
EW-1-T01N-GRW	0.76 J	0.0050 UJ	---	780 J	7.7 J

Table 1.2
Metal Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Lead (MS)	---	---	---	---	---	0.265	0.10	003EASTSEEP-T01N-GRW EW-1-D01N-GRW EW-1-T01N-GRW EW-5D-D01N-GRW EW-5D-T01N-GRW MW-4-T01N-GRW	U MB-I
Mercury (CV)	---	-0.1	---	---	---	---	0.1	EASTSEEP-T01N-GRW EASTSEEP-D01N-GRW OUTFALL002-T01N-GRW OUTFALL002-D01N-GRW EMBARGOROADSEEP-T01N-GRW EMBARGOROADSEEP-D01N-GRW MW-B-T01N-GRW MW-B-D01N-GRW MW-4-T01N-GRW MW-4-D01N-GRW MW-23-T01N-GRW MW-23-D01N-GRW 003WESTSEEP-T01N-GRW 003WESTSEEP-D01N-GRW 003EASTSEEP-T01N-GRW	UJ CCB-L
Potassium (P)	---	-667.6	-471.6	-952.9	---	-556.3	393.0	EMBARGOROADSEEP-T01N-GRW EMBARGOROADSEEP-D01N-GRW MW-4-T01N-GRW MW-4-D01N-GRW 003WESTSEEP-T01N-GRW 003WESTSEEP-D01N-GRW 003EASTSEEP-T01N-GRW 003EASTSEEP-D01N-GRW EW-5D-T01N-GRW EW-5D-D01N-GRW EW-1-T01N-GRW EW-1-D01N-GRW	J MB,CCB-L UJ MB, CCB-L
Sodium (P)	---	547.3	487.6	---	---	665.70	472.7	EW-1-D01N-GRW EW-1-T01N-GRW MW-4-D01N-GRW MW-4-T01N-GRW	U MB-I U MB,CCB-I

Table 1.2
Metal Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Zinc (P)	---	---	---	---	---	1.196	1.0	EASTSEEP-T01N-GRW EASTSEEP-D01N-GRW OUTFALL002-T01N-GRW EMBARGOROADSEEP-T01N-GRW EMBARGOROADSEEP-D01N-GRW MW-B-T01N-GRW MW-B-D01N-GRW MW-4-D01N-GRW MW-23-T01N-GRW MW-23-D01N-GRW 003WESTSEEP-T01N-GRW 003WESTSEEP-D01N-GRW 003EASTSEEP-T01N-GRW EW-5D-T01N-GRW EW-5D-D01N-GRW EW-1-T01N-GRW	U MB-I

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

For the sake of brevity, the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications

Sample	Analyte	Partial (µg/L)	Total (µg/L)	Adjusted RL* (µg/L)	Evaluation Criterion	Qualification Code
EW-1-T/D01N-GRW	Aluminum	1680	236 (U)	236	>±2x RL	J/UJ TvP-I
EW-1-T/D01N-GRW	Iron	1840	333 (U)	333	%D > 30%	
EW-1-T01N-GRW	Orthophosphate/ Phosphorus	0.039 (mg/L)	0.010 (mg/L)	0.010 (mg/L)	> ±2x RL	

*The CRDL (Contract Required Detection Limit) is used for metals evaluations.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT125C Sampling Event: July 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 09/04/03

Peer Reviewer: Stacey Coker Date Completed: 09/08/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
MW-11-T01N-GRW	SA	533518	W	X	X
MW-11-D01N-GRW	SA	533519	W	X	
MW-CH-T01N-GRW	SA	533520	W	X	X
MW-CH-D01N-GRW	SA	533521	W	X	
EW-6-T01N-GRW	SA	533522	W	X	X
EW-6-D01N-GRW	SA	533523	W	X	
EW-5B-T01N-GRW	SA	533524	W	X	X
EW-5B-D01N-GRW	SA	533525	W	X	
EW-5A-T01D-GRW	FD	533526	W	X	X
EW-5A-D01D-GRW	FD	533527	W	X	
EW-5A-T01N-GRW	SA	533528	W	X	X
EW-5A-D01N-GRW	SA	533529	W	X	
MW-13-T01N-GRW	SA	533530	W	X	X
MW-13-D01N-GRW	SA	533531	W	X	
MW-17-T01N-GRW	SA	533532	W	X	X
MW-17-D01N-GRW	SA	533533	W	X	
MW-A-T01N-GRW	SA	533534	W	X	X
MW-A-D01N-GRW	SA	533535	W	X	
RB08T-GRW	SA	533536	W	X	X

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted sample "MW-1" exhibited a slightly elevated percent difference for the anion/cation balance. There was no sample with an identifier of MW-1 included with this data package. Upon review of the anion/cation balance summary provided by the laboratory, it was evident

that the case narrative should have listed MW-A as the sample with a cation/anion balance calculation result that did not meet the acceptance limit of ≤13%. A percent difference of 15.46% was reported for samples MW-A-T01N/D01N-GRW. In evaluating the cause of the slight imbalance, the laboratory noted that the results generally compared well with historic results with the metals being somewhat elevated. Additionally, the laboratory noted that the metals results between differing dilutions agreed well and the ratio of calculated TDS versus measured TDS was acceptable (1.06). As the laboratory could not identify a cause for the imbalance, no reanalyses were conducted. The cation/anion balance of 15.46% for this sample was verified independently. It is evident from the calculation that the cation/anion imbalance stems from either an elevated cation amount or a deflated anion total. Due to low sulfate matrix recoveries, it would appear that sulfate contributed to this imbalance. However, comparison with historic results confirmed the laboratory's assertion that the cations appeared elevated. Accordingly, detected dissolved metals results for sample MW-A-D01N-GRW were qualified as estimated with a qualifier code of "TvP" and a high bias direction.

The case narrative also noted that the RPD for the replicate TKN analysis on sample MW-A-T01N-GRW was high. Although a RPD of 200% was reported, the duplicate results of 0.25 mg/L and nondetect at 0.24 mg/L are not considered to be indicative of unacceptable precision because the results agree within 1x RL. The high RPD was reported because a zero was used in the RPD calculation for the nondetect result.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for all samples were accomplished four days beyond the prescribed analytical holding time of 48 hours due to a malfunction with the IC autosampler device. Nondetect nitrate results were not rejected due to the stability of nitrate. Accordingly, all nitrate results for all samples were qualified as estimated (J/UJ). The 48-hour holding times for the majority of nitrite and orthophosphate samples were exceeded by several hours. Accordingly, analyses run outside of the holding time were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken six days after sampling and four days beyond log-in. The pH for all samples was measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blank Results	No	Ammonia in the form of nitrogen was detected in the inorganics method blank BLKNH0723C run on 07/23/03. Sample EW-6-T01N-GRW, analyzed on 07/23/03, reported an ammonia-nitrogen concentration less than five times the blank detection and was accordingly qualified as nondetect with an indeterminate bias direction. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD MW-A-T01N-GRW MW-A-D01N-GRW • PDS • LD	No	The matrix spike analysis of sample MW-A-T01N-GRW recovered sulfate below the acceptance range of 75-125%, suggesting a potential low bias in the reporting of sulfate results in samples. Silver was recovered below the acceptance range in the matrix spike analyses of samples MW-A-T01N-GRW and MW-A-D01N-GRW, also suggesting a potential low bias in the reporting of silver results. Table 1.3 summarizes these analytes along with the associated percent recoveries and the qualification codes assigned to the parent samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MW-A-T01N-GRW MW-A-D01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	Two serial dilution tests were conducted on samples MW-A-T01N-GRW and MW-A-D01N-GRW. The serial dilution results could not be used to assess potential interferences for seven of the 24 metal analytes for the total sample, and six of the 24 metals for the dissolved sample, as the remaining analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. As all %Ds for applicable metal analytes were less than 10%, none of the results of this study could be used to evaluate the presence of physical or chemical matrix interferences. Several results for metal and inorganic analytes (orthophosphate/total phosphorus) were qualified as (J/UJ) on the basis of total versus partial disagreement and assigned a qualifier code of "TvP" with an indeterminate bias direction. Table 1.4 summarizes the results qualified along with the concentrations reported. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion, with the exception of sample MW-A-T01N-GRW, which was accordingly qualified, as discussed in the case narrative section of this report. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate EW-5A-T01N/T01D-GRW EW-5A-D01N/D01D-GRW • Rinsate Blank RB08T-GRW • Field Blank • Trip Blank	N/A	All field duplicate results satisfied the evaluation criteria and data qualification was not necessary. The field QC results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	The cyanide results for sample RB08T-GRW was inadvertently reported with sample delivery group WAT126C. The metals and other inorganics parameters were correctly included in this data package (WAT125C).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH
MW-11-T01N-GRW	0.62 J	---	----	442 J	8.1 J
MW-CH-T01N-GRW	0.49 J	0.0050 UJ	---	466 J	7.7 J
EW-6-T01N-GRW	0.58 J	0.0050 UJ	0.023 J	1420 J	7.4 J
EW-5B-T01N-GRW	0.40 UJ	---	---	1580 J	7.3 J
EW-5A-T01D-GRW	0.40 UJ	---	---	1740 J	7.4 J
EW-5A-T01N-GRW	0.40 UJ	---	---	1730 J	7.4 J
MW-13-T01N-GRW	0.64 J	0.0050 UJ	0.010 UJ	631 J	8.0 J
MW-17-T01N-GRW	0.43 J	0.0050 UJ	0.15 J	652 J	7.6 J
MW-A-T01N-GRW	0.40 UJ	0.0050 UJ	---	947 J	7.0 J
RB08T-GRW	0.40 UJ	---	---	0.20 J	6.2 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Ammonia-Nitrogen	---	---	---	---	0.054 (mg/L)	0.040 (mg/L)	EW-6-T01NGRW	U MB-I
Antimony (MS)	0.6	0.6	0.7	0.6	---	0.50	EW-5A-D01N-GRW	U CCB-I
Lead (MS)	---	---	---	---	0.796	0.10	All samples	UJ MB-I
Mercury (CV)	---	-0.1	---	-0.1	---	0.1	All samples	UJ CCB-L
Zinc (P)	---	---	---	---	3.149	1.6	EW-5A-D01D-GRW EW-5A-D01N-GRW EW-5A-T01D-GRW EW-5A-T01N-GRW EW-5B-D01N-GRW EW-6-D01N-GRW EW-6-T01N-GRW MW-11-D01N-GRW MW-11-T01N-GRW MW-13-D01N-GRW MW-13-T01N-GRW MW-A-D01N-GRW MW-A-T01N-GRW RB08T-GRW	U MB-I

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Qualification Codes
MW-A-T01N-GRW				
Sulfate	66.0%	NA	75-125%	J MS-L parent
Silver	64.7	102.2		UJ MS-L parent
MW-A-D01N-GRW				
Silver	68.9	82.0		UJ MS-L parent

NA = Not appropriate

Table 1.4
Total vs. Partial Qualifications

Sample	Analyte	Partial µg/L)	Total (µg/L)	RL µg/L)	Evaluation Criterion	Qualification Code
EW-6-D/T01N-GRW	Copper	13.9	2.4 U	2.4	>±2x RL	J TvP-I
MW-11-D/T01N-GRW	Lead	4.1	0.98	0.10	%D>30%	UJ TvP-I
MW-CH-D/T01N-GRW	Vanadium	1.1	0.60	0.20	>±2x RL	J TvP-I
EW-5A-T01N-GRW	Orthophosphate/ Phosphorus	0.15	0.13	0.010 (mg/L)	>±2x RL	J TvP-I
EW-5B-T01N-GRW	Orthophosphate/ Phosphorus	12.8 (mg/L)	0.10 (mg/L)	0.250 (mg/L)	>±2x RL	J TvP-I
MW-17-T01N-GRW	Orthophosphate/ Phosphorus	0.15 (mg/L)	0.017 (mg/L)	0.010 (mg/L)	>±2x RL	J TvP-I
RB08T-GRW	Orthophosphate/ Phosphorus	0.068 (mg/L)	0.010 (mg/L)	0.010 (mg/L)	>±2x RL	J/UJ TvP-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT126C

Sampling Event: July 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 08/26/03

Peer Reviewer: Alan A. Roberts

Date Completed: 09/03/03

The table below summarizes the results presented in this data package.

Field ID	QC Type(1)	Lab ID	CLP Form Field ID Abbreviation(2)	Matrix	Analyses	
					Metals	Inorganics
MW-2-T01N-GRW	SA	533562		W	X	X
MW-2-D01N-GRW	SA	533563		W	X	
MW-7C-T01N-GRW	SA	533564		W	X	X
MW-7C-D01N-GRW	SA	533565		W	X	
MW-20-T01N-GRW	SA	533566		W	X	X
MW-20-D01N-GRW	SA	533567		W	X	
MW-20-T01D-GRW	FD	533568		W	X	X
MW-20-D01D-GRW	FD	533569		W	X	
MW-12-T01N-GRW	SA	533570		W	X	X
MW-12-D01N-GRW	SA	533571		W	X	
MW-12-T01D-GRW	FD	533572		W	X	X
MW-12-D01D-GRW	FD	533573		W	X	
WESTSEEP-T01N-GRW	SA	533574		W	X	X
WESTSEEP-D01N-GRW	SA	533575		W	X	
003CENTRALSEEP-T01N-GRW	SA	533576	003CENTSEEP-T01N-GRW	W	X	X
003CENTRALSEEP-D01N-GRW	SA	533577	003CENTSEEP-D01N-GRW	W	X	
MW-7A-T01N-GRW	SA	533578		W	X	X
MW-7A-D01N-GRW	SA	533579		W	X	
MW-22-T01N-GRW	SA	533580		W	X	X
MW-22-D01N-GRW	SA	533581		W	X	

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank FB = Field Blank RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 20 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

General Overall Assessment:

____ Data are usable without qualification.

_X_ Data are usable with qualification (noted below).

____ Some or all data are unusable for any purpose (detailed below).

Case Narrative Summary: The following issues were noted in the case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The metals analyses in this sample delivery group (SDG) were performed at the dilution levels established by Molycorp and the laboratory. These dilutions are based on the pH categories of the samples, which were determined by the field pH determinations.

The laboratory case narrative noted the laboratory control sample duplicate associated with this data package recovered selenium at 74.4%, slightly below the control criteria of 75-125%. Selenium was recovered in the LCS at 85.6%. Since recovery was only slightly outside limits and the LCS recovery was within limits, it was not considered necessary to assign qualifications on the basis of laboratory control sample recoveries for this data package.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for all samples were accomplished four to five days beyond the prescribed analytical holding time of 48 hours due to a malfunction of the IC instrument autosampler device. Nondetect nitrate results were not rejected due to the stability of nitrate. Accordingly, all nitrate results for all samples were qualified as estimated (J/UJ). In addition, the laboratory noted samples MW-20-T01N and MW-20-T01D-GRW were received one day beyond the 48 hour holding time for nitrite and orthophosphate and analyzed on the day of receipt. The 48-hour holding times for nitrite and orthophosphate were exceeded by several hours for the remaining samples in this data package. Accordingly, analyses run outside of holding time were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken six days after sampling and four days beyond log-in. The pH for all samples was measured approximately eight hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. The results were qualified as nondetect at the reported value or estimated as (J/UJ) for negative blank concentrations.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MW-2-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	A serial dilution test was conducted on one sample. The serial dilution results could be used to assess potential interferences for one of the 24 metals analyzed by ICP. None of the serial dilution percent differences were outside the evaluation criterion of ±10% and therefore no data qualification was considered necessary. The laboratory case narrative noted both copper (iron was flagged "E" instead) and sodium exhibited percent differences between the initial and diluted result in excess of 10%. However, because these analytes were present at concentrations less than 50 times the IDL, they were not appropriate for evaluation in the serial dilution analysis and the %D could not be used to evaluate the presence of physical or chemical matrix interferences. Several results for orthophosphate and phosphorus were qualified as (J) on the basis of total versus partial disagreement and assigned a qualifier code of "TvP" with an indeterminate bias direction. 1.3 summarizes the results qualified along with the concentrations reported. The boron results for samples MW-2-D01N-GRW and MW-2-T01N-GRW qualified as estimated (J/UJ TVP-I) because the dissolved boron result was greater than the total boron result. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No field QC samples were analyzed with this data package. The field QC results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The cyanide results for sample RB08T-GRW was inadvertently included with this sample delivery group. Sample RB08T-GRW was also correctly included in data package WAT125C for metals and inorganics.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH
MW-2-T01N-GRW	0.40 UJ	0.0050 UJ	0.047 J	681 J	9.1 J
MW-7C-T01N-GRW	0.40 UJ	0.0050 UJ	1.8 J	1540 J	7.3 J
MW-20-T01N-GRW	2.0 J	0.0050 UJ	0.022 J	457 J	7.5 J
MW-20-D01N-GRW	2.0 J	0.0050 UJ	0.024 J	453 J	7.5 J
MW-12-T01N-GRW	0.49 J	0.0050 UJ	0.016 J	267 J	8.0 J
MW-12-T01D-GRW	0.40 UJ	0.0050 UJ	0.018 J	266 J	8.0 J
WESTSEEP-T01N-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	1920 J	7.2 J
003CENTRALSEEP-T01N-GRW	0.40 UJ	0.0050 UJ	0.041 J	2390 J	7.3 J
MW-7A-T01N-GRW	0.44 J	0.0050 UJ	0.89 J	1530 J	7.3 J
MW-22-T01N-GRW	0.41 J	0.021 J	0.049 J	225 J	8.0 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P)	---	0.3	---	0.3	---	---	0.2	MW-22-D01N-GRW MW-2-D01N-GRW WESTSEEP-D01N-GRW	U CCB-I
Chromium (P)	-1.7	-1.7	-1.6	-2.1	---	-1.807	0.6	All samples with the **exception of:** MW-2-D01N-GRW	J MB,CCB-L UJ MB,CCB-L J CCB-L
Nickel (P)	---	---	---	---	---	-2.401	2.0	All samples with the **exception of:** 003CENTSEEP-D01N-GRW MW-2-D01N-GRW	J MB-L UJ MB-L
Zinc (P)	---	---	---	---	---	2.816	1.6	003CENTSEEP-T01N-GRW MW-22-D01N-GRW WESTSEEP-T01N-GRW	U MB-I

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

For the sake of brevity, the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications

Sample	Ortho-P (mg/L)	Phosphorus (mg/L)	RL (mg/L)	Evaluation Criterion	Qualification Code
MW-7A-T01N-GRW	0.89	0.038	0.250	≥ ±2x RL	J TvP-I
MW-22-T01N-GRW	0.049	0.026	0.010		
MW-2-T01N-GRW	0.047	0.011	0.010		
MW-7C-T01N-GRW	1.8	0.036	0.05		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT127C Sampling Event: July 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 09/02/03

Peer Reviewer: Stacey Coker Date Completed: 09/02/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
US-2-T01N-GRW	SA	533627	W	X	X
US-2-D01N-GRW	SA	533628	W	X	
MW-26-T01N-GRW	SA	533629	W	X	X
MW-26-D01N-GRW	SA	533630	W	X	
MW-9A-T01N-GRW	SA	533631	W	X	X
MW-9A-D01N-GRW	SA	533632	W	X	
EW-3-T01N-GRW	SA	533667	W	X	X
EW-3-D01N-GRW	SA	533668	W	X	
EW-5C-T01N-GRW	SA	533669	W	X	X
EW-5C-D01N-GRW	SA	533670	W	X	
MW-27-T01N-GRW	SA	533671	W	X	X
MW-27-D01N-GRW	SA	533672	W	X	
MW-21-T01N-GRW	SA	533673	W	X	X
MW-21-D01N-GRW	SA	533674	W	X	
MW-10-T01N-GRW	SA	533675	W	X	X
MW-10-D01N-GRW	SA	533676	W	X	
MW-28-T01N-GRW	SA	533677	W	X	X
MW-28-D01N-GRW	SA	533678	W	X	
US-3-T01N-GRW	SA	533679	W	X	X
US-3-D01N-GRW	SA	533680	W	X	

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the laboratory case narrative were addressed in the relevant sections in the table.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory log-in sheet noted the pH for samples US-2-T01N-GRW and US-2-D01N-GRW was checked to verify their pH class for adherence to the dilution scheme. The pH measured for these two samples classified them as class "B" samples, in contrast to class "A" samples, as was recorded on the COC. As such, the laboratory analyzed samples US-2-T01N-GRW and US-2-D01N-GRW in accordance with the dilution scheme for B/C samples, as these samples are generally class B; it is suspected that the field pH meter may have been malfunctioning that day. No data qualification was necessary and completeness was not affected.
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for all samples were accomplished three to four days beyond the prescribed analytical holding time of 48 hours due to a sample management issue at the laboratory. It is not apparent from the summary or extended data package, the nature of this issue. Nondetect nitrate results were not rejected due to the stability of nitrate. Accordingly, all nitrate results for all samples were qualified as estimated (J/UJ). Sulfate for sample MW-9A-T01N-GRW was re-analyzed 15 days beyond the prescribed analytical holding time of 28 days. As noted in the laboratory case narrative, the original anion/cation balance calculated for this sample was outside of the specified criterion. Accordingly, the laboratory re-analyzed sulfate and presented the re-analysis results. Accordingly, the sulfate result was qualified as estimated (J) on the basis of holding time; an indeterminate direction of bias was assigned. Several nitrite and orthophosphate results were qualified as estimated (J/UJ), as the prescribed analytical holding time of 48 hours was exceeded for several samples. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken six days after sampling and either three or four days beyond log-in. The pH for all samples was measured approximately five (7/12/03 analysis) or eight hours (7/11/03 analysis) beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Ammonia in the form of nitrogen was detected in the inorganics method blank BLKNH0723C run on 07/23/03. Sample US-3-T01N-GRW, analyzed on 07/23/03, reported a concentration for ammonia-nitrogen that was less than five times the blank detection and was accordingly qualified as nondetect. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (A) US-2-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	A serial dilution test was conducted on one sample. The serial dilution results could not be used to assess potential interferences for the 24 metals analyzed by ICP since no analytes reported initial concentration greater than 50 times the IDL adjusted for dilution. Therefore, the %Ds (differences between the initial and 5-fold dilution result) could not be used to evaluate the presence of physical or chemical matrix interferences.

Review Parameter	Criteria Met?	Comments
		Several results for analytes were qualified as (J/UJ) on the basis of total versus partial disagreement and assigned a qualifier code of "TvP" with an indeterminate bias direction. Table 1.3 summarizes the results qualified along with the concentrations reported. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No field QC samples were analyzed with this data package. The field QC results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH	Sulfate
US-2-T01N-GRW	0.40 UJ	---	---	416 J	6.7 J	---
MW-26-T01N-GRW	1.2 J	---	---	520 J	7.2 J	---
MW-9A-T01N-GRW	0.59 J	0.0050 UJ	---	1220 J	7.4 J	466 J
EW-3-T01N-GRW	0.46 J	0.0050 UJ	0.012 J	1400 J	6.9 J	---
EW-5C-T01N-GRW	0.40 UJ	0.0050 UJ	0.026 J	1680 J	7.2 J	---
MW-27-T01N-GRW	0.66 J	---	---	383 J	7.7 J	---
MW-21-T01N-GRW	8.5 J	---	0.015 J	1090 J	7.6 J	---
MW-10-T01N-GRW	0.57 J	0.0050 UJ	0.019 J	203 J	7.7 J	---
MW-28-T01N-GRW	0.44 J	---	---	1230 J	7.4 J	---
US-3-T01N-GRW	0.43 J	---	---	229 J	7.2 J	---

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Ammonia-Nitrogen	---	---	---	---	0.054 (mg/L)	0.040 (mg/L)	US-3-T01N-GRW	U MB-I
Beryllium (P)	0.3	0.4	0.7	0.4	---	0.2	All samples with the **exception of:** EW-5C-T01N-GRW EW-3-D01N-GRW US-2-T01N-GRW	U CCB-I
Cadmium (P)	---	0.3/0.6	---	0.6	---	0.6	US-2-D01N-GRW US-2-T01N-GRW	U CCB-I
Chromium (P) (Run 1)	-3.0	-3.0	-3.0	-3.2	-2.604	1.4	All samples with the **exception of:** US-2-T01N-GRW (Run 2)	UJ MB,CCB-L
Copper (P)	2.5	2.7	-1.6	-1.7	---	2.4	EW-3-D01N-GRW EW-5C-D01N-GRW EW-5C-T01N-GRW MW-10-T01N-GRW MW-10-D01N-GRW MW-21-T01N-GRW MW-28-D01N-GRW MW-28-T01N-GRW US-2-T01N-GRW US-3-D01N-GRW US-3-T01N-GRW	J CCB-L UJ CCB-L U CCB-I
Lead (MS)	---	---	---	---	0.704	0.10	All samples	U MB-I
Nickel (P)	-2.2	---	-2.0	-2.2	-2.715	2.0	All samples with the **exception of:** EW-5C-D01N-GRW US-2-T01N-GRW	J MB,CCB-L UJ MB,CCB-L
Zinc (P)	-8.6	-9.7	-9.8	---	---	1.6	US-2-T01N-GRW	UJ CCB-L

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

For the sake of brevity, the table is limited to those blank results that resulted in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications

Sample	Analyte	Total (µg/L)	Dissolved (µg/L)	RL (µg/L)	Evaluation Criterion	Qualification Code
EW-5C-T01N/D01N-GRW	Nickel	2.0 U	12.2	2.0	Diff>2xRL	J/UJ TvP-I
	Molybdenum	6.8	11.9	1.7		
MW-21-T01N/D01N-GRW	Copper	1.4 UJ	15.9	1.4		
US-2-T01N/D01N-GRW	Zinc	10.0 UJ	54.2	10.0		

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT128C

Sampling Event: July 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 09/09/03

Peer Reviewer: Stacey Coker

Date Completed: 09/14/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[(1)]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
MW-24-T01N-GRW	SA	533681	W	X	X
MW-24-D01N-GRW	SA	533682	W	X	
MW-25-T01N-GRW	SA	533683	W	X	X
MW-25-D01N-GRW	SA	533684	W	X	
RB04T-GRW	RB	533685	W	X	X
MW-29-T01N-GRW	SA	533686	W	X	X
MW-29-D01N-GRW	SA	533687	W	X	
RB06T-GRW	RB	533688	W	X	X
RB06D-GRW	RB	533689	W	X	
MW-15-T01N-GRW	SA	533690	W	X	X
MW-15-D01N-GRW	SA	533691	W	X	
RB07T-GRW	RB	533692	W	X	X
MW-14-T01N-GRW	SA	533693	W	X	X
MW-14-D01N-GRW	SA	533694	W	X	
MW-14-T01D-GRW	FD	533695	W	X	X
MW-14-D01D-GRW	FD	533696	W	X	
EW-2-T01N-GRW	SA	533697	W	X	X
EW-2-D01N-GRW	SA	533698	W	X	
EW-4-T01N-GRW	SA	533699	W	X	X
EW-4-D01N-GRW	SA	533700	W	X	

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the laboratory case narrative are addressed in the relevant sections in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory log-in sheet noted the pH for sample location MW-29 was checked to verify the pH class for adherence to the dilution scheme, as requested on the COC. The pH measured for this location classified the filtrate and dissolved samples as class C. No data qualification was necessary and completeness was not affected.
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for all samples were accomplished two to three days beyond the prescribed analytical holding time of 48 hours due to a malfunction with the IC autosampler device. Nondetect nitrate results were not rejected due to the stability of nitrate. Accordingly, all nitrate results for all samples were qualified as estimated (J/UJ). Several nitrite and orthophosphate results were qualified as estimated (J/UJ), as the prescribed analytical holding time of 48 hours was exceeded by several hours. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 3 days beyond log-in, with the exception of RB04T-GRW, which was measured 12 days after log-in. The pH for all samples was measured approximately 4.5 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Laboratory Blank Results	No	Ammonia in the form of nitrogen was detected in the inorganics method blank BLKNH0723C run on 07/23/03. The majority of samples reported ammonia-nitrogen concentrations less than five times the blank detection and were accordingly qualified as nondetect. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MW-24-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	A serial dilution test was conducted on one sample. The serial dilution results could not be used to assess potential interferences for the 24 metals analyzed by ICP since no analytes reported initial concentration greater than 50 times the IDL adjusted for dilution. Therefore, the %Ds (differences between the initial and 5-fold dilution result) could not be used to evaluate the presence of physical or chemical matrix interferences. The nickel concentration of 17.6 µg/L in the filtrate (dissolved) sample MW-14-D01D-GRW was greater than the nondetect nickel concentration of 2.1 µg/L in the corresponding total metals sample, MW-14-T01D-GRW. Due to the fact that neither value was greater than 5x the RL of 2.1 µg/L, the absolute difference between the two results was compared to an evaluation criterion of 2x the RL. Accordingly, the nickel results for both samples were qualified as estimated (J/UJ) with an indeterminate direction of bias for "T01D" and a high bias for "D01D". The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exception of rinsate blank sample RB06T-GRW. The reported cation/anion balance of 24.99% was verified independently. The concentrations were low enough that the reporting limits controlled the calculations. The balance was therefore not an appropriate measure of accuracy. No qualification of data in this

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		delivery group was considered necessary on the basis of cation/anion imbalances. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate MW-14-T01N/T01D-GRW MW-14-D01N/D01D-GRW • Rinsate Blank RB04T-GRW RB06T-GRW RB06D-GRW RB07T-GRW • Field Blank • Trip Blank	Yes	All field duplicate results satisfied the evaluation criteria and data qualification was not necessary. The field QC results for the July 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH
MW-24-T01N-GRW	1.5 J	0.0050 UJ	0.012 J	339 J	7.4 J
MW-25-T01N-GRW	0.48 J	---	---	309 J	8.0 J
RB04T-GRW	0.40 UJ	---	---	0.000	7.3
MW-29-T01N-GRW	0.40 UJ	---	---	1600 J	7.3 J
RB06T-GRW	0.40 UJ	---	0.010 UJ	0.45 J	7.6 J
MW-15-T01N-GRW	0.40 UJ	0.0050 UJ	0.016 J	1790 J	7.3 J
RB07T-GRW	0.40 UJ	---	---	0.91 J	7.3 J
MW-14-T01N-GRW	0.70 J	0.0050 UJ	0.016	899 J	7.3 J
MW-14-T01D-GRW	0.64 J	0.0050 UJ	0.011 J	915 J	7.3 J
EW-2-T01N-GRW	0.76 J	0.0050 UJ	0.012 J	466 J	8.0 J
EW-4-T01N-GRW	0.40 J	0.0050 UJ	0.037 J	1200 J	7.4 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Ammonia-Nitrogen	---	---	---	---	0.054 (mg/L)	0.040 (mg/L)	MW-25-T01N-GRW RB06T-GRW RB07T-GRW MW-14-T01N-GRW MW-14-T01D-GRW EW-2-T01N-GRW EW-4-T01N-GRW	U MB-I
Aluminum (P)	---	---	34.8/ 42.0	49.2/ 28.2	-30.540	18.3	All samples	UJ MB-L UJ MB,CCB-L
Beryllium (P)	---	0.3	---	0.3	---	0.2	MW-24-T01N-GRW	U CCB-I
Chromium (P) Run 2	---	-1.1	---	---	---	1.4/0.6	MW-24-T01N-GRW	J CCB-L
Iron (P) Run 1	---	-20.2	18.0	21.2	-16.810	16.8	All samples with the **exception** of: MW-24-T01N-GRW	UJ MB-L
Lead (MS)	---	0.1	---	---	1.944	0.10	All samples	U MB-I U MB,CCB-I
Potassium (P) Run 2	355.3	250.8	664.4	376.8	---	393.0/ 250.0	MW-24-T01N-GRW	U CCB-I

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

There were multiple runs for the ICP metals, on multiple instruments, therefore multiple detected concentrations may be reported per CCB/MB. The run logs verified the samples associated with the specific blank detections and were qualified accordingly.

All ICP samples were run on ICP 4, with the exception of sample MW-24-T01N-GRW, which was run on ICAP 6 on 08/21/03.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT129C

Sampling Event: July 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 09/0/03

Peer Reviewer: Stacey Coker

Date Completed: 09/0703

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
MINE1-T01N-GRW	SA	533706	W	X	X
MINE1-D01N-GRW	SA	533707	W	X	

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the laboratory case narrative are addressed in the relevant sections in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the nitrate analysis for sample MINE1-T01N-GRW was accomplished two days beyond the prescribed analytical holding time of 48 hours due to a problem with the IC autosampler. Accordingly, this result was qualified as estimated (J). The nitrite and orthophosphate results for the sample MINE1-T01N-GRW were qualified as estimated (UJ), as the prescribed analytical holding time of 48 hours was exceeded by several hours. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. The conductivity measurement for this samples was taken five days after sampling and three days beyond log-in. The pH was measured approximately four hours beyond log-in. Therefore, the conductivity and pH results were qualified as estimated (J). All samples qualified on the basis of holding time had an indeterminate direction of bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Blanks	No	Aluminum was detected in the continuing calibration blanks 2 and 3 at concentrations of -26.9, and –67.2 µg/L, respectively, which resulted in the qualification of the aluminum result for MINE1-D01N-GRW as estimated (UJ) with a low bias direction and qualifier code of "CCB."
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (B) MINE1-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	A serial dilution test was conducted on one sample. The serial dilution results could not be used to assess potential interferences for 13 of the 24 metals analyzed by ICP, as only 8 metal analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. Beryllium reported a percent difference between the initial and 5-fold dilution result of 12.4%, thereby resulting in the qualification of this analyte in the parent sample as estimated (J) with a low bias direction. The laboratory software program flagged sodium on the ICP serial dilution as "E", (indicating the presence of interference). It was determined that sodium was not applicable to the serial dilution analysis (the initial concentration was not sufficiently great enough), as 50 times the IDL (adjusted for a dilution factor of 10x on the straight analysis) was greater than the initial sodium concentration. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	No field QC samples were analyzed with this data package. The field QC results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT130A Sampling Event: July 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 10/1/03

Peer Reviewer: Alan Roberts Date Completed: 10/6/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
P-3-T01N-GRW	SA	533708		W	X	X
P-3-D01N-GRW	SA	533709		W	X	
P-5B-T01N-GRW	SA	533710		W	X	X
P-5B-D01N-GRW	SA	533711		W	X	
P-5C-T01N-GRW	SA	533712		W	X	X
P-5C-D01N-GRW	SA	533713		W	X	
P-5A-T01N-GRW	SA	533714		W	X	X
P-5A-D01N-GRW	SA	533715		W	X	
P-4B-T01N-GRW	SA	533716		W	X	X
P-4B-D01N-GRW	SA	533717		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The IPC/MS analysis labeled 082003-03 in this delivery group yielded a percent recovery for the initial calibration verification (ICV) that was slightly elevated (111%) above the laboratory's control limit of 90-110%. However, because this percent recovery is only slightly elevated and all of the continuing calibration verifications (CCVs) were within control limits, no qualification of the associated data was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the case narrative, the 48-hour holding time was exceeded by 1 day for nitrate as N due to a problem with the IC autosampler. The analysis for pH and conductivity were exceeded by 1 and 4 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, boron, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications and bias direction that was assigned.
Matrix QC • MS/MSD/PDS P-5A-T01N-GRW P-5A-D01N-GRW • LD P-5A-T01N-GRW P-5A-D01N-GRW	No	Matrix spike analyses were conducted on samples P-5A-T01N-GRW and P-5A-D01N-GRW. Six matrix spike results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued.
Method QC • Surrogates • Serial Dilution P-5A-T01N-GRW P-5A-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analyses were conducted on samples P-5A-T01N-GRW and P-5A-D01N-GRW, pH class A. Serial dilution results for sample P-5A-T01N-GRW and P5A-D01N-GRW were applicable for 6 out of 24 metals each. For sample P-5A-D01N-GRW, the percent difference between the original result and result for the diluted sample for beryllium and manganese did not satisfy the ≤10% criterion and the beryllium and manganese results for this sample were qualified as estimated. Table 1.4 summarizes these results. The serial dilution results for each sampling event will be evaluated collectively and any resultant/additional data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. For sample P-5B-T01N-GRW the analysis of orthophosphate exceeded that of the total phosphorus analysis beyond variation expected due to the accuracy limitations of the method. Table 1.5 summarizes these results and the data qualification.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were no field quality control blanks. The field quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Conductivity (umhos/cm)	pH
P-3-T01N-GRW	1.1 J	765 J	5.2 J
P-5B-T01N-GRW	2.2 J	1350 J	4.9 J
P-5C-T01N-GRW	3.1 J	1730 J	4.7 J
P-5A-T01N-GRW	4.8 J	1180 J	1.7 J
P-4B-T01N-GRW	2.5 J	1540 J	4.6 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P) 8/25 DF=100	64.4				63.1	P-5A-T01N-GRW, P-5A-D01N-GRW	U CCB-I
Boron (P) DF=10			-6.0		4.8	All samples in this SDG	UJ CCB-L
Zinc (P) DF=100				8.9	1.6	P-5A-T01N-GRW, P-5A-D01N-GRW	U MB-I

P=ICP MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
P-5A-T01N-GRW					
Total Alkalinity	30.5	NA	75-125%	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery	No qualification
Ammonia	64.2	NA		NONE	J MS-L parent
TOC	70.8	NA		NONE	J MS-L parent
Silver	51.6	NA		NONE	J MS-L parent
Cyanide	19.9	NA		It was not considered necessary to reject the nondetect result for the parent sample due to the acidic nature of the sample (pH=4.8).	J MS-L parent
P-5A-D01N-GRW					
Silver	48.6	NA	75-125%	NONE	J MS-L parent

NA = Not appropriate

Table 1.4
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Action
P-5A-D01N-GRW		
Beryllium	11.2	Qualify parent sample J SD-H
Manganese	11.9	Qualify parent sample J SD-H

Table 1.5
Total vs. Dissolved Qualifications for Metals

Sample/Analytes	Absolute Difference	RL	Action
MMW-2-T01N/D01N-GRW			
Orthophosphate vs. Phosphorus	0.025	0.01	Results for these analytes in sample P-5B-T01N-GRW in this package were qualified as estimated (J or UJ). The bias direction is considered to be indeterminate.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT131C Sampling Event: July 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter Date Completed: 09/08/03

Peer Reviewer: Stacey Coker Date Completed: 09/08/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[(1)]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
RB01T-SED	RB	533865	W	X	X
RB03T-SED	RB	533866	W	X	X
RB02T-SED	RB	533867	W	X	X
SPRING18-T01N-GRW	SA	534048	W	X	X
SPRING18-D01N-GRW	SA	534049	W	X	
SPRING17-T01N-GRW	SA	534050	W	X	X
SPRING17-D01N-GRW	SA	534051	W	X	
SPRING15T-T01N-GRW	SA	534052	W	X	X
SPRING15T-D01N-GRW	SA	534053	W	X	
SPRING14T-T01N-GRW	SA	534054	W	X	X
SPRING14T-D01N-GRW	SA	534055	W	X	

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The case narrative also noted the RPD for the replicate phosphorus analysis on sample SPRING18-T01N-GRW was high. Although a RPD of 200% was reported, the duplicate results of 0.011 mg/L and nondetect at 0.010 mg/L are not considered to be indicative of unacceptable precision because the results agree within 1x RL. The high RPD was reported because a zero was used in the RPD calculation for the nondetect result.

In addition, the laboratory case narrative summary noted the original sulfate analysis of sample SPRING14T-T01N-GRW yielded a concentration of 29.5 mg/L, below the historical concentration of 120 mg/L. This sample was re-analyzed beyond the prescribed holding time of 28 days to yield a sulfate result of 27.4 mg/L. The data from the original analysis was presented. This did not affect the quality or usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As mentioned in the laboratory case narrative, the nitrate and chloride analyses for sample SPRING14T-T01N-GRW were re-performed outside of analytical holding time in order to bring the anion/cation balance into the acceptance range of ±13%. For this sample, the 28 day holding time for chloride was exceeded by 15 days, whereas the 48 hour holding time for nitrate was exceeded by 41 days. Despite the fact that the nitrate reanalysis was exceeded by well over two times the analytical holding time, the result for this sample was detected at a concentration above the reporting limit and was according qualified as estimated (J). Several nitrate, nitrite and orthophosphate results were qualified as estimated (J/UJ), as the prescribed analytical holding time of 48 hours was exceeded by several hours. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 21 days after sampling and 19 days beyond log-in. The pH for all samples was measured approximately 6.5 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Lead, mercury, and zinc was detected in the metal preparation blanks, resulting in the qualification of results for these three analytes. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD SPRING18-T01N-GRW SPRING18-D01N-GRW • PDS • LD	No	Silver was recovered below the acceptance range in the matrix spike analyses of samples SPRING18-T01N-GRW and SPRING18-D01N-GRW, suggesting potential low biases in the reporting of silver results. Table 1.3 summarizes these analytes along with the associated percent recoveries and the qualification codes assigned to the parent samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) SPRING18-T01N-GRW SPRING18-D01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	Two serial dilution tests were conducted on matrix spike samples SPRING18-T01N-GRW and SPRING18-D01N-GRW. The serial dilution results could not be used to assess potential interferences for seven of the 24 metals analyzed by ICP since 17 analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. Table 1.4 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The silver concentration of 0.63 µg/L in the filtrate (dissolved) sample SPRING18-D01N-GRW was greater than the nondetect silver concentration of 0.20 µg/L in the corresponding total metals sample, SPRING18-T01N-GRW. Due to the fact that neither value was greater than 5x the RL of 0.20 µg/L, the absolute difference between the two results was compared to an evaluation criterion of 2x the RL. Accordingly, the silver results for both samples were qualified as estimated (J/UJ) with an indeterminate direction of bias. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank RB01T-SED RB02T-SED RB03T-SED • Field Blank • Trip Blank	N/A	The field QC results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.
Laboratory Performance Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	The high standard of nitrate dropped on some ICALs, however all samples were within the range of the calibration curve.
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	Information regarding the mass resolution is not available due to software limitations. However, acceptable mass resolution can be inferred from the other QC sample results which satisfied evaluation criteria.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH	Chloride
SPRING18-T01N-GRW	0.53 J	0.0050 UJ	0.010 UJ	320 J	8.1 J	---
SPRING17-T01N-GRW	0.83 J	0.0050 UJ	0.010 J	455 J	7.4 J	---
SPRING15T-T01N-GRW	0.45 J	---	---	340 J	7.9 J	---
SPRING14T-T01N-GRW	0.38 J	---	---	230 J	8.2 J	9.2 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Lead (MS)	---	0.1	---	---	0.292	0.10	RB01T-SED RB02T-SED RB03T-SED	U MB-I
Mercury (CV)	---	---	---	---	0.150	0.1	All samples with the **exception of:** SPRING17-D01N-GRW	U MB-I
Zinc (P)	---	---	---	---	2.423	1.6	RB03T-SED	U MB-I

P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Action
SPRING18-T01N-GRW				
Silver	59.9	84.0	75-125%	UJ MS-L parent
SPRING18-D01N-GRW				
Silver	59.8	85.3		UJ MS-L parent

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification
SPRING18-T01N-GRW		
Manganese	15.7	UJ DL-H parent
SPRING18-D01N-GRW		
Arsenic	10.8	J DL-L parent
Manganese	10.9	UJ DL-H parent

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT136C

Sampling Event: July 2003 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Ansley Watson

Date Completed: 9/20/03

Peer Reviewer: Larry Brook

Date Completed: 10/06/03 (SS), 2/22/04 (LPR)

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
COLUMBINE CAMPGROUND WELL-T01N-GRW	SA	534475	COLCGWELL-T01N-GRW	W	X	X
COLUMBINE CAMPGROUND WELL-D01N-GRW	SA	534476	COLCGWELL-D01N-GRW	W	X	
ELEPHANTROCK CAMPGROUND WELL-T01N-GRW	SA	534477	EROCKCGWELL-T01N-GRW	W	X	X
ELEPHANTROCK CAMPGROUND WELL-D01N-GRW	SA	534478	EROCKCGWELL-D01N-GRW	W	X	
LABWELL-T01N-GRW	SA	534479		W	X	X
LABWELL-D01N-GRW	SA	534480		W	X	
LABWELL-T01D-GRW	FD	534481		W	X	X
LABWELL-D01D-GRW	FD	534482		W	X	
COMPANY CABIN WELL-T01N-GRW	SA	534483	COMPCAB-T01N-GRW	W	X	X
COMPANY CABIN WELL-D01N-GRW	SA	534484	COMPCAB-D01N-GRW	W	X	
FAGERQUIST WELL-T01N-GRW	SA	534485	FAGERWELL-T01N-GRW	W	X	X
FAGERQUIST WELL-D01N-GRW	SA	534486	FAGERWELL-D01N-GRW	W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The 0.2 mg/L calibration point for nitrate as N could not be included in the calibration due to a misidentification by the ion chromatography software. Accordingly, the laboratory calculated nitrate as N results manually, with this low-end calibration point omitted. This resulted in the increased nitrate as N reporting limit of 0.5 mg/L, as verified by the data sheets. These calculations are included in the raw data section of the data package. The quality and usability of the data was not affected, as the QAPP specifies a maximum reporting limit of 1.0 mg/L for nitrate as N.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the nitrate as N samples were re-analyzed one day beyond the holding time and reported due to a backlog created when there was a malfunction in the instrument. The 48-hour holding time was exceeded by less than 48 hours for nitrite as N and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 22 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony, chloride, potassium, mercury, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution COLCGWELL-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample COLCGWELL-T01N-GRW, pH class C. The result was applicable for 1 out of 24 metals. All %D for applicable analytes were within the acceptance range of <10%. The serial dilution results for the July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. In calculating the charge balances, it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit for samples COLCGWELL-T01N-GRW, COMPCAB-T01N-GRW, and FAGERWELL-T01N-GRW. These are summarized in Table 1.3.
Field QC • Field Duplicate (FD) LABWELL-T01D-GRW LABWELL-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	All field duplicate results satisfied the evaluation criteria and data qualification was not necessary. The field quality control results for the July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results and the nitrate as N results discussed above. In cases of blank detections resulting in qualification, the RL was raised to the reported value.
Package Completeness	No	Upon receipt of this sample delivery group (SDG), it was noticed that arsenic was accidentally not included in the results for the metals, while cadmium was reported twice. The laboratory was contacted, and the metal analysis pages were corrected and resubmitted.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Review Parameter	Criteria Met?	Comments
Laboratory-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
COLCGWELL-T01N-GRW	1.0 UJ	0.005 UJ	0.01 UJ	129 J	7.6 J
EROCKCGWELL-T01N-GRW	1.0 UJ	0.005 UJ	0.01 UJ	225 J	7.1 J
LABWELL-T01N-GRW	1.0 UJ	0.005 UJ	0.01 UJ	281 J	7.2 J
LABWELL-T01D-GRW	1.0 UJ	0.005 UJ	0.01 UJ	277 J	7.2 J
COMPCAB-T01N-GRW	1.0 UJ	---	---	153 J	7.4 J
FAGERWELL-T01N-GRW	1.0 UJ	---	---	123 J	7.3 J

-- = Samples were analyzed within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB Metal (µg/l) Chloride (mg/l)	IDL (Metals) (µg/l) RL (Chloride) (mg/l)	Samples Qualified	Qualification Code
Chloride						0.2	0.2	COLCGWELL-T01N-GRW, COMPCAB-T01N-GRW, FAGERWELL-T01N-GRW	U MB-I
Antimony (MS) DF=2	1.1	1.0	1.0				0.5	LABWELL-T01N-GRW	U CCB-I
Potassium (P) DF=1		339.4	387.8	514.7		330.3	250	All samples in this SDG.	U CCB, MB-I
Mercury (CV) DF=1				0.1	0.2	0.14	0.1	All samples in this SDG.	U CCB, MB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB Metal (µg/l) Chloride (mg/l)	IDL (Metals) (µg/l) RL (Chloride) (mg/l)	Samples Qualified	Qualification Code
Zinc (P) DF=10						2.5	2	EROCKCGWELL-T01N-GRW, EROCKCGWELL-D01N-GRW, LABWELL-T01N-GRW, LABWELL-D01N-GRW, LABWELL-T01D-GRW, LABWELL-D01D-GRW, COMPCAB-T01N-GRW, COMPCAB-D01N-GRW FAGERWELL-D01N-GRW	U MB-I

P=ICP MS=ICP-MS CV = Cold Vapor MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total Dissolved Solids Summary

Sample	TDS Measured (mg/L)	TDS Calculated (mg/L)	Qualification Code
COLCGWELL-T01N-GRW	78	130	J TvP-L
COMCAB-T01N-GRW	90	150	J TvP-L
FAGERWELL-T01N-GRW	82	125	J TvP-L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT137A Sampling Event: July 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 9/18/03

Peer Reviewer: Larry Brook Date Completed: 10/08/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
COLUMBINENO1-T01N-GRW	SA	534487	COLNO1-T01N-GRW	W	X	X
COLUMBINENO1-D01N-GRW	SA	534488	COLNO1-D01N-GRW	W	X	
COLUMBINENO2-T01N-GRW	SA	534489		W	X	X
COLUMBINENO2-D01N-GRW	SA	534490		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the laboratory form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted that the 0.2 mg/L calibration point for nitrate as N could not be included in the calibration due to a misidentification by the ion chromatography software. Accordingly, the laboratory calculated nitrate as N results manually, with this low-end calibration point omitted. This resulted in the increased nitrate as N reporting limit of 0.5 mg/L, as verified by the data sheets. These calculations are included in the raw data section of the data package. The quality and usability of the data was not affected, as the QAPP specifies a maximum reporting limit of 1.0 mg/L for nitrate as N.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The chain of custody forms for the four samples reported in this data package included some incorrect sampling date and time information. Correct sample collection date and time was obtained from the field logbooks and field sample data sheets. Correct sample collection dates and times for these four samples follow: COLUMBINE NO 1-T01N-GRW 07/16/03 1745 COLUMBINE NO 1-D01N-GRW 07/16/03 1745 COLUMBINE NO 2-T01N-GRW 07/16/03 1645 COLUMBINE NO 2-D01N-GRW 07/16/03 1645 All sample volumes/ aliquot including the MS/MSD fraction for COLUMBINE NO 1-T01/D01N-GRW were assigned the sample times listed above.
	No	As noted in the laboratory case narrative, the original nitrate analyses were accomplished within the prescribed analytical holding time of 48 hours. However, due to a malfunction of the instrument that resulted in the introduction of air into the system, the associated continuing calibration verification analyses exhibited elevated recoveries indicating a potential high bias in the analytical results. The nitrate samples were re-analyzed one day beyond the holding time and reported. In sample COLUMBINENO2-T01N-GRW the 48-hour holding time was exceeded by 10 days for orthophosphate due to a sample management error at the laboratory. The analysis for pH and conductivity were exceeded by 1-2 and 15-16 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, beryllium, and cadmium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS COLNO1-T01N-GRW COLNO1-D01N-GRW • LD COLNO1-T01N-GRW COLNO1-D01N-GRW	No	Matrix spike analyses were conducted on samples COLNO1-T01N-GRW and COLNO1-D01N-GRW. Five matrix spike results were outside acceptance limits. Table 1.3 summarize these results and the data qualification issued.
Method QC • Surrogates • Serial Dilution COLNO1-T01N-GRW COLNO1-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on samples COLNO1-T01N-GRWand CONLNO1-D01N-GRW, pH class A. For both samples the percent difference between the original result and result for the diluted sample for beryllium did not satisfy the ≤10% criterion and the results for these two samples were qualified as estimated. Table 1.4 summarizes these results. The serial dilution results for each sampling event will be evaluated collectively and any resultant/additional data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exceptions of COLUMBINE NO 2-T/D01N-GRW (14.93%), which agrees with the recalculated cation/anion balance. Four of the cation concentrations contributing to the calculation of this balance (Mg^{2+}, K^{+}, Na^{+}, and Al^{3+}) were not detected above the instrument detection limit (IDL) and were therefore reported at the detection limit. Recalculation of the balance, using ½ the concentration for Na+, which contributed significantly to this balance (25%meq/L), resulted in a cation/anion balance of 1.79%. The concentrations were low enough that reporting limits controlled the calculations. The balances were therefore not an appropriate measure of accuracy. No qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	There were no field quality control blanks or samples in the sample delivery package. The field quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
COLNO1-T01N-GRW	2.7 J	---	1440 J	5.2 J
COLUMBINENO2-T01N-GRW	1.5 J	0.010 UJ	894 J	5.4 J

-- -= Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=100	42.8	45.7	55.8	27.9	18.3	COLNO1-T01N-GRW, COLNO1-D01N-GRW	U CCB-I
						COLUMBINENO2-T01N-GRW, COLUMBINENO2-D01N-GRW	U CCB, MB-I
Beryllium (P) DF=10	0.3	0.3	0.4		0.2	COLNO1-D01N-GRW, COLUMBINENO2-T01N-GRW	U CCB-I

P=ICP MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
COLNO1-T01N-GRW					
Ammonia	60.9	NA	75-125%	NONE	J MS-L parent
Silver	54.2	84.6		NONE	UJ MS-L parent
Cyanide	50.8	113.0		It was not considered necessary to reject the nondetect result for the parent sample due to the acidic nature of the sample (pH=5.2).	UJ MS-L parent
COLNO1-D01N-GRW					
Selenium	127.4	99.5	75-125%	Parent sample is nondetect	No qualification
Silver	51.1	82.2		It was not considered necessary to reject the nondetect result for the parent sample due to the acidic nature of the sample (pH=5.2).	UJ MS-L parent

NA = Not appropriate

Table 1.4
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
COLNO1-T01N-GRW			
Beryllium	15.8	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample J SD-L
COLNO1-D01N-GRW			
Beryllium	18.0	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample J SD-L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT140C

Sampling Event: July 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 09/10/03

Peer Reviewer: Stacey Coker

Date Completed: 09/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type(1)	Lab ID	Matrix	Analyses	
				Metals	Inorganics
MMW-29B-T01N-GRW	SA	534721	W	X	X
MMW-29B-D01N-GRW	SA	534722	W	X	
MMW-18B-T01N-GRW	SA	534723	W	X	X
MMW-18B-D01N-GRW	SA	534724	W	X	
MMW-40A-T01N-GRW	SA	534725	W	X	X
MMW-40A-D01N-GRW	SA	534726	W	X	
MMW-19B-T01N-GRW	SA	534727	W	X	X
MMW-19B-D01N-GRW	SA	534728	W	X	
MMW-25B-T01N-GRW	SA	534729	W	X	X
MMW-25B-D01N-GRW	SA	534730	W	X	
RB05T-GRW	RB	534731	W	X	X
SPRING12A-T01N-GRW[2]	SA	534732	W	X	X
SPRING12A-D01N-GRW[2]	SA	534733	W	X	
MMW-42B-T01N-GRW	SA	534734	W	X	X
MMW-42B-D01N-GRW	SA	534735	W	X	

Matrix: W = Water RB = Rinsate Blank

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]This sample was collected a t location "Spring 12A" which differs from the permit location "Spring 12." The sample collected from the DP-933 permit location "Spring 12" is reported in WAT148C.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted the metal analyses in this delivery group were performed at the dilution levels established by the scheme. An exception to this was lead for sample MMW-18B-T01N-GRW. This result was reported from the Trace ICP instead of ICP-MS, due to a concentration in excess of the calibrated linear range of the ICP-MS. This did not affect the quality or usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory log-in sheet noted an error on the COC; sample "MMW-19B" was incorrectly written as "MMW-19". Upon realization of this problem, the client contacted the laboratory via a facsimile to note this error and ensure the sample was logged in under the correct sample ID. No data qualification was necessary and completeness was not affected by this inadvertent error on the COC form.
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for samples MMW-29B-T01N-GRW, MMW-18B-T01N-GRW, MMW-40A-T01N-GRW, and MMW-19B-T01N-GRW were accomplished two days beyond the prescribed analytical holding time of 48 hours due to a backlog of samples caused by a series of instrument malfunctions. In addition, the nitrate analyses for the remaining samples were accomplished 19 days beyond the holding time due to a sample management error at the laboratory. It is not apparent from the summary or extended data package, the nature of this issue. Nondetect nitrate results were not rejected due to the stability of nitrate. Accordingly, all nitrate results for all samples were qualified as estimated (J/UJ). The 48-hour holding times for the majority of nitrite and orthophosphate samples were exceeded by several hours. Accordingly, analyses run outside of the holding time were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 24 days beyond log-in. The pH for all samples was measured approximately five hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J/UJ). Sulfate for sample MMW-19B-T01N-GRW was re-analyzed outside of the prescribed analytical holding time of 28 days. An elevated sulfate result (relative to historical results), in conjunction with a cation/anion imbalance were the reasons for this re-analysis. Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MMW-29B-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance	Yes	One serial dilution test was conducted on sample MMW-29B-T01N-GRW. The serial dilution results could not be used to assess potential interferences for 22 of the 24 metal analytes, as only two analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. As all %Ds for applicable metal analytes were less than 10%, none of the results of this study could be used to evaluate the presence of physical or chemical matrix interferences. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion, with the exception of sample MMW-19B-T01N-GRW. The original sulfate result was elevated relative to historical results. The sample was re-analyzed for sulfate, outside of holding-time, resulting in a sulfate concentration which brought the cation/anion within acceptable range. No qualification of data was necessary on the basis of cation/anion imbalance.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank RB05T-GRW • Field Blank • Trip Blank	N/A	The field QC results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N	Nitrite	Ortho-P	Cond.	pH	Sulfate
MMW-29B-T01N-GRW	0.40 UJ	0.0050 UJ	0.017 J	967 J	7.4 J	---
MMW-18B-T01N-GRW	0.60 J	0.016 J	0.010 UJ	2640 J	6.9 J	---
MMW-40-T01N-GRW	1.9 J	0.0050 UJ	0.11 J	933 J	6.5 J	---
MMW-19B-T01N-GRW	0.40 UJ	0.0050 UJ	0.010 UJ	2390 J	6.9 J	1360 J
MMW-25B-T01N-GRW	0.20 UJ	0.0050 UJ	0.014 J	2180 J	7.0 J	---
RB05T-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	0.19 J	7.0 J	---
SPRING12-T01N-GRW	0.38 J	0.0050 UJ	0.051 J	405 J	8.0 J	---
MMW-42B-T01N-GRW	0.20 UJ	---	---	2690 J	7.1 J	---

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Chromium (P)	---	---	---	---	---	-3.275	1.4	All samples with the **exception** of: MMW-18B-T01N-GRW	UJ MB-L
Mercury (CV)	---	---	---	---	-0.1	---	0.1	MMW-19B-D01N-GRW MMW-19B-T01N-GRW MMW-25B-D01N-GRW MMW-25B-T01N-GRW MMW-40A-D01N-GRW MMW-42B-D01N-GRW MMW-42B-T01N-GRW RB05T-GRW SPRING12-D01N-GRW SPRING12-T01N-GRW	UJ CCB-L
Nickel (P)	-3.9	-3.8	-3.8	-3.8	---	-6.643	2.1	MMW-18B-D01N-GRW MMW-25B-D01N-GRW MMW-25B-T01N-GRW MMW-29B-D01N-GRW MMW-29B-T01N-GRW MMW-40A-D01N-GRW MMW-40A-T01N-GRW MMW-42B-D01N-GRW MMW-42B-T01N-GRW RB05T-GRW SPRING12-D01N-GRW SPRING12-T01N-GRW	J MB-L UJ MB,CCB-L J MB,CCB-L
Zinc (P)	---	---	---	---	---	2.649	1.6	MMW-40A-D01N-GRW MMW-40A-T01N-GRW	U MB-I

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT144C Sampling Event: July 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 9/25/03

Peer Reviewer: Larry Brook Date Completed: 10/08/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MMW-2-T01N-GRW	SA	534826		W	X	X
MMW-2-D01N-GRW	SA	534827		W	X	
CHAMBER SPRING-T01N-GRW	SA	534932	CHAMBER-T01N-GRW	W	X	X
CHAMBER SPRING-D01N-GRW	SA	534933	CHAMBER-D01N-GRW	W	X	
MMW-3-T01N-GRW	SA	534934		W	X	X
MMW-3-D01N-GRW	SA	534935		W	X	
MMW-44B-T01N-GRW	SA	534936		W	X	X
MMW-44B-D01N-GRW	SA	534937		W	X	
MMW-23B-T01N-GRW	SA	534938		W	X	X
MMW-23B-D01N-GRW	SA	534939		W	X	
MMW-10B-T01N-GRW	SA	534940		W	X	X
MMW-10B-D01N-GRW	SA	534941		W	X	
MMW-35B-T01N-GRW	SA	534942		W	X	X
MMW-35B-D01N-GRW	SA	534943		W	X	
MMW-13-T01N-GRW	SA	534944		W	X	X
MMW-13-D01N-GRW	SA	534945		W	X	
MMW-43A-T01N-GRW	SA	534946		W	X	X
MMW-43A-D01N-GRW	SA	534947		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The metal analysis of laboratory control sample (LCS) yielded slightly low percent recoveries (LCS=67.2%, LCSD=68.2%) of the target analyte silver. The control limit for this analyte is 75-125%.

Since the LCS recoveries were less than the lower limit but >10%, the silver results for all samples in this data package have been qualified as estimated (UJ/J) with a low bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the nitrate as N analyses for samples were accomplished seven days beyond the prescribed analytical holding time of 48 hours due to a backlog of samples caused by a series of instrument malfunctions. Because nitrate is the stable form of oxidized nitrogen, the nitrate as N data are still considered usable as qualified despite the holding time being exceeded by more than two times the holding time criterion. In addition, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2-3 and 23-24 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony, beryllium, copper, mercury, nickel, sodium, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-2-T01N-GRW CHAMBER SPRING-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on samples MMW-2-T01N-GRW and CHAMBER SPRING-T01N-GRW, pH class C, and was applicable for 0 out of 24 analytes. Recovery for internal standard Li was high for the ICPMS analysis of samples MMW-2-T01N-GRW, MMW-2-D01N-GRW, CHAMBER SPRING-T01N-GRW, CHAMBER SPRING-D01N-GRW, MMW-3-T01N-GRW, MMW-23B-T01N-GRW, and MMW-23B-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this internal standard. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-2-T01N-GRW, MMW-10B-T01N-GRW, and MMW-11A-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this internal standards. For sample MMW-2-T01N/D01N-GRW the analysis of partial chromium exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.3 summarizes these results and the data qualification.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	There were no field quality control blanks. The field quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
MMW-2-T01N-GRW	0.40 UJ	0.005 UJ	0.01 UJ	2290 J	6.1 J
CHAMBER-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	269 J	8.0 J
MMW-3-T01N-GRW	0.2 UJ	---	0.01 UJ	2290 J	7.0 J
MMW-44B-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	2780 J	6.8 J
MMW-23B-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	716 J	7.7 J
MMW-10B-T01N-GRW	0.2 UJ	---	0.01 UJ	2520 J	6.2 J
MMW-35B-T01N-GRW	0.2 UJ	---	0.01 UJ	3060 J	6.8 J
MMW-13-T01N-GRW	0.3 J	0.024 J	0.01 UJ	1790 J	7.1 J
MMW-43A-T01N-GRW	0.2 UJ	---	0.01 UJ	2110 J	7.1 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS) DF=2	1.0	1.0	1.1	1.1				0.5	MMW-44B-T01N-GRW	U CCB-I
Beryllium (P) DF=1			0.2				-0.26	7.3	CHAMBER-T01N-GRW, CHAMBER-D01N-GRW, MMW-3-T01N-GRW, MMW-3-D01N-GRW, MMW-23B-T01N-GRW, MMW-23B-D01N-GRW, MMW-13-D01N-GRW, MMW-43A-T01N-GRW	UJ/J MB-L
									MMW-13-T01N-GRW, MMW-43A-T01N-GRW	UJ CCB, MB-
Copper (P) DF=1				1.8			1.4	1.4	MMW-2-D01N-GRW	U CCB, MB-I
Mercury 8/14 (CV) DF=1			-0.1					0.1	MMW-2-D01N-GRW	UJ CCB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Mercury 8/15 (CV) DF=1		0.1		0.1				0.1	CHAMBER-T01N-GRW, CHAMBER-D01N-GRW, MMW-3-T01N-GRW, MMW-3-D01N-GRW, MMW-44B-D01N-GRW, MMW-23B-T01N-GRW, MMW-23B-D01N-GRW, MMW-10B-T01N-GRW, MMW-10B-D01N-GRW, MMW-35B-T01N-GRW, MMW-35B-D01N-GRW, MMW-13-T01N-GRW, MMW-13-D01N-GRW, MMW-43A-T01N-GRW, MMW-43A-D01N-GRW	U CCB-I
Nickel (P) DF=1							-4.4	2.0	CHAMBER-T01N-GRW, CHAMBER-D01N-GRW, MMW-3-T01N-GRW, MMW-3-D01N-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, MMW-23B-T01N-GRW, MMW-23B-D01N-GRW, MMW-13-T01N-GRW, MMW-13-D01N-GRW, MMW-43A-T01N-GRW, MMW-43A-D01N-GRW	UJ/J MB-L
Sodium (P) DF=10					-1429	-803.9		532.3	MMW-10B-T01N-GRW, MMW-10B-D01N-GRW, MMW-35B-T01N-GRW, MMW-35B-D01N-GRW, MMW-13-T01N-GRW, MMW-13-D01N-GRW, MMW-43A-T01N-GRW, MMW-43A-D01N-GRW	J CCB-L
Zinc (P) DF=10							5.5	1.6	CHAMBER-T01N-GRW, CHAMBER-D01N-GRW, MMW-3-T01N-GRW, MMW-3-D01N-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, MMW-23B-T01N-GRW, MMW-43A-T01N-GRW, MMW-43A-D01N-GRW	U MB-I

P=ICP MS=ICP-MS CV = Cold Vapor MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Dissolved Qualifications for Metals

Sample/Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
MMW-2-T01N/D01N-GRW				
Chromium	7.1	1.9	Absolute difference <2x RL	J TvP-I for samples MMW-2-T01N-GRW and MMW-2-D01N-GRW.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT145A Sampling Event: July 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 9/23/03

Peer Reviewer: Larry Brook Date Completed: 10/12/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MMW-23A-T01N-GRW	SA	534963		W	X	X
MMW-23A-D01N-GRW	SA	534964		W	X	
PORTAL SPRING-T01N-GRW	SA	534965	PORTALSPRING-T01N-GRW	W	X	X
PORTAL SPRING-D01N-GRW	SA	534966	PORTALSPRING-D01N-GRW	W	X	
MMW-45A-T01N-GRW	SA	534967		W	X	X
MMW-45A-D01N-GRW	SA	534968		W	X	
SPRING 14M-T01N-GRW	SA	534969		W	X	X
SPRING 14M-D01N-GRW	SA	534970		W	X	
SPRING 14MA-T01N-GRW	SA	537971		W	X	X
SPRING 14MA-D01N-GRW	SA	534972		W	X	
CAPULIN SPRING-T01N-GRW	SA	534973	CAPSPRG-T01N-GRW	W	X	X
CAPULIN SPRING-D01N-GRW	SA	534974	CAPSPRG-D01N-GRW	W	X	
CAPULIN SPRING SOURCE-T01N-GRW	SA	534975	CAPSPRGSOURC-T01N-GRW	W	X	X
CAPULIN SPRING SOURCE-D01N-GRW	SA	534976	CAPSPRGSOURC-D01N-GRW	W	X	
MMW-47A-T01N-GRW	SA	534977		W	X	X
MMW-47A-D01N-GRW	SA	534978		W	X	
GOATHILL SPRING SOURCE-T01N-GRW	SA	534979	GOATSPGSOURC-T01N-GRW	W	X	X
GOATHILL SPRING SOURCE-D01N-GRW	SA	534980	GOATSPGSOURC-D01N-GRW	W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The case narrative issues were noted in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for samples received 7/22/03 were originally run on 7/23/03. However, due to a series of instrument malfunctions these samples were reanalyzed 7 days beyond the holding time (7/29/03). Therefore, these samples were reanalyzed a second time 18 days beyond the holding time (8/09/03) due the possibility of air being introduced into the system. The results from 8/9/03 yielded results that were comparable to those on 7/29/03, therefore the 7/29/03 results were reported except for CAPSPRG-T01N-GRW, CAPSPRGSOURC-T01N-GRW, and GOATSPGSOURC-T01N-GRW. During the analysis performed on 7/29/03, samples CAPSPRG-T01N-GRW, CAPSPRGSOURC-T01N-GRW, and GOATSPGSOURC-T01N-GRW exhibited elevated baselines indicating interference related to the sample matrix. This was confirmed in the analysis from 8/9/03. These samples were reanalyzed at a dilution on 8/13/03 yielding acceptable results; therefore these three samples were reported from this 8/13/03 reanalysis group. Because nitrate is the stable form of oxidized nitrogen, the nitrate as N data are still considered useable as qualified despite the holding time being exceeded by more than two times the holding time criterion. In addition, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N, and orthophosphate. The seven-day holding time for TDS was exceeded by eight days for samples CAPSPRG-T01N-GRW, CAPSPRGSOURC-T01N-GRW, and GOATSPGSOURC-T01N-GRW. The analysis for pH and conductivity were exceeded by two and 21 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, chromium, copper, mercury, nickel, silver, sodium, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-23A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample MMW-23A-T01N-GRW, pH class C, and was applicable for 1 out of 24 analytes. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-23A-T01N-GRW, MMW-23A-D01N-GRW, MMW-45A-T01N-GRW, MMW-45A-D01N-GRW, CAPULIN SPRING-T01N-GRW, CAPULIN SPRING-D01N-GRW, CAPULIN SPRING SOURCE-T01N-GRW, CAPULIN SPRING SOURCE-D01N-GRW, GOATHILL SPRING SOURCE-T01N-GRW, and GOATHILL SPRING SOURCE-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this internal standard. Recovery for internal standard Tb was high for the ICPMS analysis of samples CAPULIN SPRING-T01N-GRW, CAPULIN SPRING-D01N-GRW, CAPULIN SPRING SOURCE-T01N-GRW, CAPULIN SPRING SOURCE-D01N-GRW, GOATHILL SPRING SOURCE-T01N-GRW, and GOATHILL SPRING SOURCE-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this internal standard. For samples CAPULIN SPRING-T01N-GRW, CAPULIN SPRING SOURCE-T01N-GRW, and GOATHILL SPRING SOURCE-T01N-GRW the analysis of orthophosphate exceeded that of the total analysis of phosphorus beyond variation expected due to the accuracy limitations of the method. Also in sample MMW-45A-T01N/D01N-GRW the analysis of dissolved exceeded that of the total analysis in nickel. Table 1.3 summarizes these results and the data qualification. In calculating the charge balances, it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit for sample MMW-45A-T01N/D01N-GRW. These data are summarized in Table 1.4.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	There were no field quality control blanks in this SDG. The field quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	pH	Conductivity (umhos/cm)
MMW-23A-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	---	6.0 J	2050 J
PORTAL SPRING-T01N-GRW	0.93 J	---	0.01 UJ	---	5.2 J	547 J
MMW-45A-T01N-GRW	0.26 J	---	0.01 UJ	---	3.6 J	1920 J
SPRING 14M-T01N-GRW	0.2 UJ	---	0.01 UJ	---	4.3 J	820 J
SPRING 14MA-T01N-GRW	0.2 UJ	---	0.01 UJ	---	4.6 J	618 J
CAPULIN SPRING-T01N-GRW	2.0 UJ	0.079 J	16.9 J	21200 J	3.0 J	10400 J
CAPULIN SPRING SOURCE-T01N-GRW	2.0 UJ	0.08 J	0.67 J	22700 J	3.0 J	10300 J
MMW-47A-T01N-GRW	1.6 J	---	0.01 UJ	---	4.0 J	1030 J
GOATHILL SPRING SOURCE-T01N-GRW	2.0 UJ	0.081 J	8.6 J	27900 J	2.9 J	11000 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=100			-77.4	-83.6	-84.9	-82.7	-92.6	18.3	MMW-23A-T01N-GRW, MMW-23A-D01N-GRW, PORTALSPRING-T01N-GRW, POSTALSPRING-D01N-GRW, SPRING14M-T01N-GRW, SPRING14M-D01N-GRW, SPRING14MA-T01N-GRW, SPRING14MA-D01N-GRW, MMW-47A-T01N-GRW, MMW-47A-D01N-GRW	UJ/J CCB, MB-L
Chromium (P) DF=100			-1.1	-1.8	-1.3	-1.4	-1.8	0.6	All samples in this SDG.	UJ/J CCB, MB-L
Copper (P) DF=100			1.6		1.4			1.4	MMW-23A-T01N-GRW, MMW-23A-D01N-GRW, PORTALSPRING-T01N-GRW, POSTALSPRING-D01N-GRW, SPRING14M-T01N-GRW, SPRING14M-D01N-GRW, SPRING14MA-T01N-GRW, SPRING14MA-D01N-GRW, MMW-47A-T01N-GRW, MMW-47A-D01N-GRW	U CCB-I
Mercury (CV) DF=1		-0.1						0.1	MMW-23A-T01N-GRW, MMW-23A-D01N-GRW, PORTALSPRING-T01N-GRW, POSTALSPRING-D01N-GRW, MMW-45A-T01N-GRW, MMW-45A-D01N-GRW, SPRING14M-T01N-GRW, SPRING14M-D01N-GRW, SPRING14MA-T01N-GRW, SPRING14MA-D01N-GRW, CAPSPRG-D01N-GRW, CAPSPRGSOURC-T01N-GRW, CAPSPRGSOURC-D01N-GRW, MMW-47A-T01N-GRW	UJ/J CCB-L
Nickel (P) DF=100							-2.7	2.0	MMW-23A-T01N-GRW, MMW-23A-D01N-GRW, PORTALSPRING-T01N-GRW, POSTALSPRING-D01N-GRW, MMW-45A-T01N-GRW, SPRING14M-T01N-GRW, SPRING14MA-D01N-GRW, MMW-47A-T01N-GRW, MMW-47A-D01N-GRW	UJ/J MB-L
Silver (P) DF=1	2.1	1.4	1.4	2.0			0.99	0.9	MMW-23A-T01N-GRW, MMW-23A-D01N-GRW, PORTALSPRING-T01N-GRW, POSTALSPRING-D01N-GRW, MMW-45A-T01N-GRW,	U CCB, MB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
									MMW-45A-D01N-GRW, SPRING14M-D01N-GRW, SPRING14MA-T01N-GRW, SPRING14MA-D01N-GRW, MMW-47A-T01N-GRW, MMW-47A-D01N-GRW	
									CAPSPRG-D01N-GRW, CAPSPGSOURCE-T01N-GRW, CAPSPGSOURCE-D01N-GRW, GOATHILLSPRGSOURCE-T01N-GRW, GOATHILLSPRGSOURC-D01N-GRW	U CCB-I
Sodium (P) DF=100					223.8			218.8	SPRING14MA-T01N-GRW, MMW-47A-T01N-GRW, MMW-47A-D01N-GRW	U CCB-I
Zinc (P) DF=100			-14.6	-15	-14.8	-14.8	-15.2	5.7	MMW-23A-T01N-GRW, MMW-23A-D01N-GRW, PORTALSPRING-T01N-GRW, POSTALSPRING-D01N-GRW, MMW-45A-T01N-GRW, MMW-45A-D01N-GRW, SPRING14M-T01N-GRW, SPRING14M-D01N-GRW, SPRING14MA-T01N-GRW, SPRING14MA-D01N-GRW, MMW-47A-T01N-GRW, MMW-47A-D01N-GRW	UJ/J CCB, MB-L

P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank MB = Method Blank IDL = Instrument Detection Limit

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Inorganics and Metals

Sample/Analytes	Absolute Difference	RL	Action
CAPULIN SPRING-T01N-GRW			
Orthophosphate vs. Phosphorus	16.89	0.25	J/UJ TvP-I for sample CAPULIN SPRING-T01N-GRW
CAPULIN SPRING SOURCE-T01N-GRW			
Orthophosphate vs. Phosphorus	0.66	0.01	J/UJ TvP-I for CAPULIN SPRING SOURCE-T01N-GRW.
GOATHILL SPRING SOURCE-T01N-GRW			
Orthophosphate vs. Phosphorus	8.59	0.25	J/UJ TvP-I for GOATHILL SPRING SOURCE-T01N-GRW.
MMW-45A-T01N/D01N-GRW			
Nickel	18794	200	J/UJ TvP-I for MMW-45A-T01N/D01N-GRW.

Table 1.4
Total Dissolved Solids Summary

Sample	TDS Measured (mg/L)	TDS Calculated (mg/L)	Qualification
MMW-45A-T01N-GRW	2400	798	J TvP-H

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT146A Sampling Event: July 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 10/2/03

Peer Reviewer: Larry Brook Date Completed: 10/09/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
GOATHILL SPRING-T01N-GRW	SA	534981	GOATHILLSPRG-T01N-GRW	W	X	X
GOATHILL SPRING-D01N-GRW	SA	534982	GOATHILLSPRG-D01N-GRW	W	X	
GOATHILL SPRING-T01D-GRW	FD	534983	GOATHILLSPRG-T01D-GRW	W	X	X
GOATHILL SPRING-D01D-GRW	FD	534984	GOATHILLSPRG-D01D-GRW	W	X	
MMW-28B-T01N-GRW	SA	535524		W	X	X
MMW-28B-D01N-GRW	SA	535525		W	X	
MMW-31B-T01N-GRW	SA	535526		W	X	X
MMW-31B-D01N-GRW	SA	535527		W	X	
MMW-36B-T01N-GRW	SA	535528		W	X	X
MMW-36B-D01N-GRW	SA	535529		W	X	
GWW-3-T01N-GRW	SA	535530		W	X	X
GWW-3-D01N-GRW	SA	535531		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the case narrative, the 48-hour holding time was exceeded by 18 days for nitrate as N due to a malfunction with the IC autosampler that caused the data to not generate and the reanalyzed samples ran the following day had problems with the matrix interference. Because nitrate is the stable form of oxidized nitrogen, the nitrate as N data are still considered usable as qualified despite the hold time being exceeded by more than two times the holding time criterion. In addition, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 21or 23 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Cadmium, chromium, cobalt, copper, mercury, selenium, and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS GWW-3-T01N-GRW GWW-3-D01N-GRW • LD GWW-3-T01N-GRW GWW-3-D01N-GRW	No	Matrix spike analyses were conducted on samples GWW-3-T01N-GRW and GWW-3-D01N-GRW. Twenty matrix spike results were outside acceptance limits. Table 1.3 summarizes these results and the data qualification issued. Laboratory duplicate analyses were conducted on GWW-3-T01N-GRW and GWW-3-D01N-GRW. One laboratory duplicate results was outside acceptance limits. Table 1.4 summarizes this result and the data qualification issued. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution GWW-3-T01N-GRW GWW-3-D01N-GRW Internal Standards Total vs. Partial Analyses Cation/Anion Balance	No	The serial dilution analyses were conducted on samples GWW-3-T01N-GRW and GWW-3-D01N-GRW, pH class A, and were both applicable for 4 out of 24 analytes. Recovery for internal standards Tb and Y were high for the ICPMS analysis of samples GOATHILL SPRING-T01N-GRW, GOATHILL SPRING-D01N-GRW, GOATHILL SPRING-T01D-GRW, and GOATHILL SPRING-D01D-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using these internal standards. For samples GOATHILL SPRING-T01N-GRW, and GOATHILL SPRING-T01D-GRW the analysis of orthophosphate exceeded that of the total analysis of phosphorus beyond variation expected due to the accuracy limitations of the method. Table 1.4 summarizes these results and the data qualification.
Field QC Field Duplicate (FD) GOATHILL SPRING-T01D-GRW GOATHILL SPRING-D01D-GRW Rinsate Blank (RB) Field Blank (FB) Trip Blank (TB) Other (e.g., splits)	No	This package included field duplicate (FD) samples that were slightly outside the control criteria as summarized in Table 1.5. The field quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Conductivity (umhos/cm)	pH
GOATHILL SPRING-T01N-GRW	2.0 UJ	---	---	22200 J	10300 J	2.8 J
GOATHILL SPRING-T01D-GRW	2.0 UJ	---	---	22800 J	10200 J	2.8 J
MMW-28B-T01N-GRW	0.66 J	0.005 UJ	0.01 UJ	---	895 J	4.7 J
MMW-31B-T01N-GRW	0.4 UJ	0.005 UJ	0.01 UJ	---	2920 J	6.6 J
MMW-36B-T01N-GRW	0.4 UJ	0.005 UJ	0.16 J	---	4150 J	4.6 J
GWW-3-T01N-GRW	3.4 J	0.005 UJ	0.029 J	---	1920 J	4.5 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Cadmium (P) DF=100		-2.3			1.2	GOATHILL SPRING-T01N-GRW, GOATHILL SPRING-D01N-GRW, GOATHILL SPRING-T01D-GRW, GOATHILL SPRING-D01D-GRW, GWW-3-T01N-GRW, GWW-3-D01N-GRW	UJ/J CCB-L
Chromium (P) DF=100		-4.5			1.9	GOATHILL SPRING-T01N-GRW, GOATHILL SPRING-D01N-GRW, GOATHILL SPRING-T01D-GRW, GOATHILL SPRING-D01D-GRW, GWW-3-T01N-GRW, GWW-3-D01N-GRW	UJ/J CCB-L
Cobalt (P) DF=100		-4.8			3.7	GWW-3-T01N-GRW, GWW-3-D01N-GRW	UJ CCB-L
Copper (P) DF=100		-9.2			3.3	GWW-3-T01N-GRW, GWW-3-D01N-GRW	J CCB-L
Mercury (CV) DF=1		-0.1	-0.1		0.1	GOATHILL SPRING-T01N-GRW, GOATHILL SPRING-D01N-GRW, GOATHILL SPRING-T01D-GRW, GOATHILL SPRING-D01D-GRW, GWW-3-T01N-GRW, GWW-3-D01N-GRW	UJ/J CCB-L
Selenium (MS) DF=10		3.5			0.8	GOATHILL SPRING-T01N-GRW, GOATHILL SPRING-D01N-GRW, GOATHILL SPRING-T01D-GRW, GOATHILL SPRING-D01D-GRW, GWW-3-T01N-GRW, GWW-3-D01N-GRW	U CCB-I
Sodium (P) DF=100	850.7		719.1	1556 1225	532.3	GOATHILL SPRING-D01N-GRW, GOATHILL SPRING-T01D-GRW, GOATHILL SPRING-D01D-GRW	U CCB, MB-I

P=ICP MS=ICP-MS CV = Cold Vapor MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results And Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
GWW-3-T01N-GRW					
Total Alkalinity	11.0	NA	75-125%	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery	No qualification
Ammonia	73.5	NA		NONE	UJ MS-L parent
Sulfate	69.0	NA		NONE	J MS-L parent
TOC	72.0	NA		NONE	J MS-L parent
Cadmium	0.0	109.2		Spike added is less than IDL.	No qualification
Chromium	64.8	108.2		NONE	UJ MS-L parent
Lead	189.5	96.3		Nondetect	No qualification
Iron	0.0	105		Spike added is less than IDL.	No qualification
Silver	144.7	81.9		Nondetect	No qualification
Nickel	133.6	108.4		Nondetect	No qualification
Thallium	127.6	96.7		Nondetect	No qualification
Cyanide	52.1	114.8		NONE	UJ MS-L parent
GWW-3-D01N-GRW					
Cadmium	151.4	104.1	75-125%	Nondetect	No qualification
Lead	137.0	105.2		Nondetect	No qualification
Iron	0.0	113.6		Spike added is less than IDL.	No qualification
Silver	141.5	85.6		Nondetect	No qualification
Nickel	169.1	104.6		Nondetect	No qualification
Thallium	128.7	102.4		Nondetect	No qualification
Copper	156.1	105.3		NONE	J MS-H parent
Selenium	134.8	92		NONE	J MS-H parent

NA = Not appropriate

Table 1.4
Laboratory Duplicate Results and Parent Sample Qualifications

Analyte	Result (mg/L)	Duplicate mg/L)	RL (mg/L)	Criterion	Qualification
GWW-3-T01N-GRW					
Fluoride	2580	1880	10	RPD > 31	J D-I

Table 1.5
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Absolute Difference	RL	Evaluation Criteria	Action
GOATHILL SPRING-T01N-GRW				
Orthophosphate vs. Phosphorus	14.49	0.25	Evaluation criteria is met when the absolute difference is less than 2x RL	J/UJ TVP-I for sample GOATHILL SPRING-T01N-GRW.
GOATHILL SPRING-T01D-GRW				
Orthophosphate vs. Phosphorus	14.39	0.25	Evaluation criteria is met when the absolute difference is less than 2x RL	J/UJ TVP-I for sample GOATHILL SPRING-T01D-GRW.

Table 1.6
Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	GOATHILL SPRING-T01N-GRW	GOATHILL SPRING-T01D-GRW	Criteria Comment	Outside Criteria	RL	Action
Mercury (µg/l)	1.0	0.20	Abs. Diff. <2xRL (0.2)	Abs Diff.=0.67	0.1	J FD-L parent and duplicate sample

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT147A Sampling Event: July 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 9/22/03

Peer Reviewer: Larry Brook Date Completed: 10/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MMW-32A-T01N-GRW	SA	535220		W	X	X
MMW-32A-D01N-GRW	SA	535221		W	X	
MMW-19A-T01N-GRW	SA	535222		W	X	X
MMW-19A-D01N-GRW	SA	535223		W	X	
MMW-8B-T01N-GRW	SA	535224		W	X	X
MMW-8B-D01N-GRW	SA	535225		W	X	
WALDOSPRING-T01N-GRW	SA	535226		W	X	X
WALDOSPRING-D01N-GRW	SA	535227		W	X	
CABINSPRINGS-T01N-GRW	SA	535228		W	X	X
CABINSPRINGS-D01N-GRW	SA	535229		W	X	
MMW-31A-T01N-GRW	SA	535230		W	X	X
MMW-31A-D01N-GRW	SA	535231		W	X	
MMW-11-T01N-GRW	SA	535232		W	X	X
MMW-11-D01N-GRW	SA	535233		W	X	
MMW-30A-T01N-GRW	SA	535234		W	X	X
MMW-30A-D01N-GRW	SA	535235		W	X	
MMW-11A-T01D-GRW	FD	535236		W	X	X
MMW-11A-D01D-GRW	FD	535237		W	X	
MMW-11A-T01N-GRW	SA	535238		W	X	X
MMW-11A-D01N-GRW	SA	535239		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the nitrate analyses for samples were accomplished seven days beyond the prescribed analytical holding time of 48 hours due to a backlog of samples caused by a series of instrument malfunctions. Because nitrate is the stable form of oxidized nitrogen, the nitrate as N data are still considered useable as qualified despite the holding time being exceeded by more than two times the holding time criterion. In addition, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 1-2 and 15-16 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Beryllium, chromium, sodium, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-32A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample MMW-32A-T01N-GRW, pH class C, and was applicable for 1 out of 24 analytes. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-32A-T01N-GRW, MMW-32A-D01N-GRW, MMW-19A-T01N-GRW, MMW-19A-D01N-GRW, MMW-31A-T01N-GRW, MMW-31A-D01N-GRW, MMW-11-T01N-GRW, MMW-11-D01N-GRW, MMW-30A-T01N-GRW, MMW-30A-D01N-GRW, MMW-11A-T01D-GRW, MMW-11A-D01D-GRW, MMW-11A-T01N-GRW, and MMW-11A-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this internal standard.
Field QC • Field Duplicate (FD) MMW-11A-T01D-GRW MMW-11A-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package included field duplicate (FD) samples that were slightly outside the control criteria as summarized in Table 1.3. The field quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results The metal analysis of interference check sample (ICS) yielded a slightly high percent recovery (ICS=121%) of the target compound Lead. This was slightly outside of the control criteria of 90-110%. As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
MMW-32A-T01N-GRW	3.8 J	---	---	2190 J	4.7 J
MMW-19A-T01N-GRW	4.3 J	---	---	2190 J	4.3 J
MMW-8B-T01N-GRW	3.0 J	0.005 UJ	0.04 J	2380 J	5.6 J
WALDOSPRING-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	794 J	5.1 J
CABINSPRINGS-T01N-GRW	2.2 J	0.005 UJ	0.01 UJ	1340 J	4.6 J
MMW-31A-T01N-GRW	3.9 J	---	---	2100 J	4.4 J
MMW-11-T01N-GRW	4.6 J	---	---	2210 J	4.5 J
MMW-30A-T01N-GRW	3.4 J	0.005 UJ	0.014 J	1950 J	4.5 J
MMW-11A-T01D-GRW	4.3 J	---	---	2190 J	4.3 J
MMW-11A-T01N-GRW	4.3 J	---	---	2210 J	4.3 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=10	-0.4			0.4		0.2	MMW-32A-D01N-GRW, MMW-8B-T01N-GRW, MMW-8B-D01N-GRW	UJ CCB-L
							MMW-32A-T01N-GRW, MMW-19A-T01N-GRW, MMW-19A-D01N-GRW	U CCB-I
Chromium (P) DF=100			-2.0			1.9	WALDOSPRING-T01N-GRW, WALDOSPRING-D01N-GRW, CABINSPRINGS-T01N-GRW, CABINSPRINGS-D01N-GRW, MMW-31A-T01N-GRW, MMW-31A-D01N-GRW, MMW-11-T01N-GRW, MMW-11-D01N-GRW, MMW-30A-T01N-GRW, MMW-30A-D01N-GRW, MMW-11A-T01N-GRW, MMW-11A-D01N-GRW, MMW-11A-T01D-GRW, MMW-11A-D01D-GRW	UJ CCB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Sodium (P) DF=100		637.5				532.3	MMW-32A-T01N-GRW, MMW-32A-D01N-GRW, MMW-19A-D01N-GRW, MMW-8B-T01N-GRW, MMW-8B-D01N-GRW, MMW-30A-T01N-GRW	U CCB-I
Zinc (P) DF=100	-4.5	-4.2	-4.3	-4.3	-4.7	1.6	MMW-8B-T01N-GRW, MMW-8B-D01N-GRW, WALDOSPRING-T01N-GRW, WALDOSPRING-D01N-GRW	UJ CCB, MB-L

P=ICP MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	MMW-30A-T01N-GRW	MMW-30A-T01D-GRW	Criteria Comment	Outside Criteria	RL	Action
TSS (mg/l)	1.6	20.2	Abs. Diff. <2xRL (1.0)	Abs Diff.=18.6	0.5	J FD-I parent and duplicate sample

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT148C

Sampling Event: July 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 09/18/03

Peer Reviewer: S. Coker/L. Brook

Date Completed: 09/18/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	Explosives	VOCs
RB03T-GRW	RB	535269		W	X	X		
RB01T-GRW	RB	535270		W	X	X		
MMW-8A-T01N-GRW	SA	535271		W	X	X		
MMW-8A-D01N-GRW	SA	535272		W	X			
SPRING12-T01N-GRW	SA	535273		W	X	X		
SPRING12-D01N-GRW	SA	535274		W	X			
MMW-30B-T01N-GRW	SA	535275	3BT01NGRW	W	X	X		X
MMW-30B-D01N-GRW	SA	535276		W	X			
MMW-30B-T01D-GRW	FD	535277	30BT01DGRW	W	X	X		X
MMW-30B-D01D-GRW	FD	535278		W	X			
FB01T-GRW	FB	535279		W				X
RB01T-GRW	RB	535280		W				X
TB-223-GRW	TB	535281		W				X
CC2A-T01N-GRW	SA	535282		W	X	X		
CC2A-D01N-GRW	SA	535283		W	X			
CC2B-T01N-GRW	SA	535284		W	X	X		
CC2B-D01N-GRW	SA	535285		W	X			
CC1A-T01N-GRW	SA	535286		W	X	X[3]		
CC1A-D01N-GRW	SA	535287		W	X			
CC1B-T01N-GRW	SA	535288		W	X	X		
CC1B-D01N-GRW	SA	535289		W	X			
RB01T-GRW	RB	535290		W			X	
FB01T-GRW	FB	535291		W			X	
MMW-30B-T01N-GRW	SA	535292	OBT01NGRW	W			X	
MMW-30B-T01D-GRW	FD	536292	MW30BT01DGRW	W			X	

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank FB = Field Blank TB = Trip Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

[3]Limited inorganics due to low recharge capacity and small inside diameter of well.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the laboratory case narrative.

In order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances abbreviate the sample identifiers. The electronically formatted data provides for the full sample identifier.

The laboratory case narrative noted the original volatile organics analyses for samples MMW-30B-T01N-GRW and MMW-30B-T01D-GRW reported concentrations in excess of the calibrated range, thereby requiring dilution analyses. In addition, the original analyses for samples RB01T-GRW and FB01T-GRW reported surrogate recoveries outside the control criteria in conjunction with shifts in retention time windows. Accordingly, all of these samples were reanalyzed within the prescribed analytical holding time. Additionally, it is noted that the continuing calibration check standard associated with the re-analyses exhibited a decreased response for Bromomethane, resulting in a percent difference that exceeded control criteria. This resulted in the qualification of Bromomethane in associated samples as estimated (UJ) with an indeterminate bias direction and qualifier code of "CCAL". These qualifications are summarized in the "Other Parameters" section at the end of the table, along with other volatile data qualifications on the basis of Initial and Continuing Calibration Verifications.

The laboratory case narrative noted the nitroaromatic analysis of the blank spike samples O8LCS, Q6LCS, and Q6LCSD yielded generally acceptable recoveries, with the exception of the target compound PYX, which yielded recoveries of 58%, 62%, and 55%, respectively. The laboratory has not yet established control limits for this compound at this time, therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries were less than the lower limit but >10%, the PYX results for samples FB01T-GRW and RB01T-GRW have been qualified as estimated (UJ), with a low bias direction. PYX results for samples MMW-30B-T01N-GRW and MMW-30B-T01D-GRW were rejected on the basis of low matrix spike recovery.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The sample preservation document noted that upon log-in, samples MMW-30B-T01N-GRW, MMW-30B-D01N-GRW, MMW-30B-T01D-GRW, and MMW-30B-D01D-GRW for the analysis of hardness and metals, were received with pH values greater than 2 and subsequently required the addition of HNO_3^- to attain the proper pH for preservation. No qualification was necessary for the metal results for these samples due to the fact that the nitric acid added would have dissolved most of the metals that might have precipitated out. This was further supported by the observation that the dissolved metal concentrations are comparable to the total metal concentrations. No data qualification was necessary and completeness was not affected.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Holding Times	No	As mentioned in the laboratory case narrative, the nitrate analyses for all samples were accomplished 7 days beyond the prescribed analytical holding time of 48 hours due to a backlog of samples caused by a series of instrument malfunctions. Due to the stability of nitrate, nondetect and detect results were qualified as estimated (J/UJ). The majority of nitrate and orthophosphate analyses were performed several hours beyond the prescribed analytical holding time of 48 hours, and were accordingly qualified as estimated. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 22 days after sampling and 20 days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). As mentioned in the laboratory case narrative, the nitroaromatics analysis of sample MMW-30B-was accomplished 3 days beyond the prescribed extraction time of 7 days due to a sample management issue at the laboratory. It is not apparent from the summary or extended data package, the nature of this issue. Accordingly, all results for the explosives analytes for this sample were qualified as estimated (J/UJ). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD MMW-30B-T01N-GRW MMW-30B-D01N-GRW • PDS • LD	No	Nitrite, orthophosphate, and TOC were recovered below the acceptance limits of 75-125% in the matrix spike analysis of sample MMW-30B-T01N-GRW. Selenium, silver, and cyanide were recovered below the acceptance range of 75-125% in the two metals matrix spike analyses (the dissolved fraction had an acceptable cyanide recovery), indicating a potential low bias in the reporting of these analytes in sample results. The explosives matrix spike analysis of sample MMW-30B-T01N-GRW resulted in the recovery of all five target analytes outside the acceptance ranges. The matrix spike duplicate recovered one analyte within the acceptance limit. Table 1.3 summarizes the matrix spike detections along with the qualifications assigned to the parent sample. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (C) MMW-30B-T01N-GRWSL MMW-30B-D01N-GRWSL • Total vs. Partial Analyses Cation/Anion Balance	No	The surrogate recoveries of the system monitoring compounds Toulene-d8 and Bromofluorobenzene were recovered outside the control criteria for several of the samples analyzed for volatiles. As method OLM04.1 directs, if the surrogate criteria are not met for any sample, the sample must be reanalyzed. Samples MMW-30B-T01N-GRWMS, FB01T-GRW, and RB01T-GRW were reanalyzed with acceptable surrogate recoveries. No qualification was necessary on the basis of surrogate recoveries for volatiles. The surrogate recovery of 1,2-Dinitrobenzene for the explosives analyses were significantly high in all samples analyzed (MMW-30B-T01N-GRW, MMW-30B-T01D-GRW, in addition to the matrix spike and matrix spike duplicate samples). The laboratory case narrative noted the surrogate monitoring compound exceeded control criteria of 85-166% on both the LC-18 and CN columns due to the presence of interference related to the sample matrix. Table 1.4 summarizes the surrogate recoveries, along with qualifications assigned. It is noted that this sample matrix has had surrogate recovery problems historically, consistent with matrix interference, (Refer to data packages WAT019,WAT040C, WAT064C, WAT079C). Two serial dilution analyses were run and presented with the data in this package. The serial dilutions were conducted on the matrix spike samples. Both serial dilutions were not applicable for seven ICP-MS metal analytes, as the remaining 17 analytes reported initial sample results which were sufficiently larger (50x) than the IDL, adjusted for the relevant dilution factor. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. The percent difference for antimony for sample MMW-30B-T01N-GRW was 12.5%, thereby resulting in the qualification of this analyte as estimated (UJ), with a low bias direction assigned. The antimony result for the field duplicate sample, MMW-30B-T01D-GRW, was qualified as well, with a qualifier code of UJ DL-L assigned. Two samples were qualified on the basis of partial vs. total disagreements. Table 1.5 summarizes these samples, along with the reported concentrations and qualifications assigned. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and consequently did not require data qualification. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5.
Field QC • Field Duplicate MMW-30B-T01N/T01D-GRW MMW-30B-D01N/D01D-GRW • Rinsate Blank RB03T-GRW (metals, inorganics) RB01T-GRW (metals, inorganics) RB01T-GRW (VOCs) RB01T-GRW (explosives) • Field Blank FB01T-GRW (VOCs) FB01T-GRW (explosives) • Trip Blank TB-223-GRW	No	All field duplicate results satisfied the evaluation criteria and data qualification was not necessary. The field QC results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	There were no cyanide results provided for sample location SPRING12 in the summary or extended data package. According to the COC, a "W-9" bottle, for cyanide analysis was sent to the lab for sample SPRING12-T01N-GRW.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs: Initial Calibration • VOCs: Continuing Calibration • Metals: Interference Check Sample Results Table 1.6 summarizes the continuing calibration results that were outside the evaluation criteria and any resultant data qualification issues. No qualification was necessary on the basis of initial calibration check for volatile data, as all %Ds and RRFs (relative retention factors) met acceptance criteria as specified in the functional guidelines. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
RB03T-GRW	0.20 UJ	---	---	1.2 J	5.2 J
RB01T-GRW	0.20 UJ	---	---	0.12 J	5.9 J
MMW-8A-T01N-GRW	0.20 UJ	0.0050 UJ	0.030 J	2430 J	7.0 J
SPRING12-T01N-GRW	0.37 J	0.0050 UJ	0.010 UJ	480 J	7.7 J
MMW-30B-T01N-GRW	0.20 UJ	R*	0.51 J	2300 J	7.2 J
MMW-30B-T01D-GRW	0.20 UJ	R*	0.54 J	2320 J	7.2 J
CC2A-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	1490 J	6.1 J
CC2B-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	1700 J	7.0 J
CC1A-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	551 J	7.1 J
CC1B-T01N-GRW	0.20 UJ	---	---	618 J	7.4 J
Explosives	**HMX (µg/L)**	**RDX (µg/L)**	**PETN (µg/L)**	**2,4,6-Trinitrotoluene (µg/L)**	**PYX (µg/L)**
MMW-30B-T01D-GRW	0.25 UJ	2.7 J	R*	0.25 UJ	R*

*The Nitrate as N results for these samples and PETN/PYX result for the one sample were rejected due to low matrix spike recovery (reference Table 1.3)

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P)	---	---	0.4	0.6	0.4	---	0.20	CC1A-D01N-GRW CC1A-T01N-GRW CC1B-T01N-GRW CC2B-T01N-GRW MMW-30B-T01D-GRW SPRING12-T01N-GRW	U CCB-I
Cadmium (P)	1.0	0.8	0.6	0.6	0.8	32.81	0.3	CC2A-D01N-GRW CC2A-T01N-GRW	U MB,CCB-I
Chromium (P)	---	0.7	---	---	---	---	0.6	SPRING12-T01N-GRW SPRING12-D01N-GRW	U CCB-I
Copper (P)	---	---	---	-1.5	-1.5	---	1.4	CC1A-D01N-GRW CC1B-D01N-GRW CC1B-T01N-GRW CC2A-D01N-GRW CC2A-T01N-GRW CC2B-D01N-GRW CC2B-T01N-GRW MMW-30B-D01D-GRW MMW-30B-T01D-GRW	UJ CCB-L
Mercury (CV)	---	-0.1	---	---	---	0.120	0.10	CC2A-D01N-GRW	U MB-I
Nickel (P)	3.4	3.8	3.7	3.0	3.9	---	2.0	CC1A-D01N-GRW CC1A-T01N-GRW CC1B-D01N-GRW MMW-30B-D01D-GRW MMW-8A-D01N-GRW MMW-8A-T01N-GRW	U CCB-I

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL = IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R or MS/MSD %Rs	PDS %R	Criteria	Comment	Action
MMW-30B-T01N-GRW					
Nitrite	15.0	NA	75-125%	< 30%	R parent + FD
Orthophosphate	54.1	NA		---	J MS-L parent + FD
Total Organic Carbon	72.3	NA		---	J MS-L parent + FD
Selenium	23.6	84.6		< 30%	R parent + FD
Silver	28.9	77.2		< 30%	R parent + FD
Cyanide	61.6	86.2		---	J MS-L parent + FD
HMX	82/82	NA	83-122	---	UJ MS-L parent + FD
RDX	60/55	NA	81-116	---	J MS-L parent + FD
2,4,6-Trinitrotoluene	108/105	NA	75-106	---	UJ MS-H parent + FD
PETN	-25/-75	NA	75-110	< 10%	R parent + FD
PYX	0/0	NA	70-130	< 10%	R parent + FD
MMW-30B-D01N-GRW					
Selenium	23.3	84.4	75-125%	Below 30%	R parent + FD
Silver	28.6	82.2		Below 30%	R parent + FD

NA = Not appropriate FD = Field Duplicate

Table 1.4
Explosives Surrogate Recoveries Resulting in Qualification

Sample	LC-18 Column (%)	CN Column (%)	Analytes Qualified*	Qualification
MMW-30B-T01N-GRW	150	947	HMX RDX 2,4,6-Trinitrotoluene	J SUR-H
MMW-30B-T01D-GRW	219	1554		

*The remaining results for explosives analytes on the target list, PETN and PYX, were rejected on the basis of low matrix spike recoveries.
Note: The surrogate recoveries for the MS and MSD for this sample also reported surrogate recoveries outside the acceptance limit.

Table 1.5
Total vs. Partial Concentrations Resulting in Qualification

Sample	Total Phosphorus (mg/L)	Orthophosphate (mg/L)	Qualification Code
MMW-30B-T01N-GRW	0.053	0.51	J TvP-I
MMW-30B-T01D-GRW	0.044	0.54	J TvP-I

Table 1.6
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date (Time)	Analyte	% D >25%	Samples Qualified	Qualification and Qualification Codes
VOC	07/25/03 (2205)	Dichlorodiflouromethane	31.0	MMW-30B-T01D-GRW MMW-30B-T01N-GRW FB01T-GRW HB148C RB01T-GRW TB-223-GRW	UJ CCAL-I
VOC	07/28/03 (2153)	Dichlorodiflouromethane	26.8	MMW-30B-T01D-GRWDL MMW-30B-T01N-GRWDL FB01T-GRWRE HB148CRE RB01T-GRWRE	UJ CCAL-I
		Bromomethane	58.6		
		Chloroethane	-28.6		

CCAL = Initial Calibration %D = Percent difference between the initial and continuing calibration RRFs

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT149A Sampling Event: July 2003

Matrix: Solid ___Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 9/25/03

Peer Reviewer: Alan Roberts Date Completed: 10/07/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MMW-10A-T01N-GRW	SA	535499		W	X	X
MMW-10A-D01N-GRW	SA	535500		W	X	
MMW-10C-T01N-GRW	SA	535501		W	X	X
MMW-10C-D01N-GRW	SA	535502		W	X	
MMW-33A-T01N-GRW	SA	535503		W	X	X
MMW-33A-D01N-GRW	SA	535504		W	X	
MMW-49A-T01N-GRW	SA	535505		W	X	X
MMW-49A-D01N-GRW	SA	535506		W	X	
GWW-1-T01N-GRW	SA	535507		W	X	X
GWW-1-D01N-GRW	SA	535508		W	X	
GWW-2-T01N-GRW	SA	535509		W	X	X
GWW-2-D01N-GRW	SA	535510		W	X	
UPPER SPRING 39-T01N-GRW	SA	535511	UPPERSPRG39-T01N-GRW	W	X	X
UPPER SPRING 39-D01N-GRW	SA	535512	UPPERSPRG39-D01N-GRW	W	X	
LOWER SPRING 13-T01N-GRW	SA	535513	LOWERSPRG13-T01N-GRW	W	X	X
LOWER SPRING 13-D01N-GRW	SA	535514	LOWERSPRG13-D01N-GRW	W	X	
SPRING 13 PUMP-T01N-GRW	SA	535515	SPRING13PUMP-T01N-GRW	W	X	X
SPRING 13 PUMP-D01N-GRW	SA	535516	SPRING13PUMP-D01N-GRW	W	X	
SPRING 39 PUMP-T01N-GRW	SA	535517	SPRING39PUMP-T01N-GRW	W	X	X
SPRING 39-PUMP-D01N-GRW	SA	535518	SPRING39PUMP-D01N-GRW	W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

As noted in the laboratory case narrative, the anion/cation balances for samples MMW-10C-T/D01N-GRW, MMW-49A-T/D01N-GRW, UPPERSPRING39-T/D01N-GRW and SPRING13PUMP10-T/D01N-GRW exhibited elevated anion results; sulfate was suspected as contributing primarily to this imbalance. The sulfate analyses were re-performed outside the analytical holding time of 28 days; the results for the re-analyses yielded acceptable anion/cation balance calculations. As such, the sulfate results for the re-analyses were reported and accordingly qualified as estimated (J), on the basis of holding time. Table 1.1 summarizes holding time qualifications

The nitrate analyses of the calibration check standards associated with the samples in this sample delivery group (SDG) yielded percent recoveries that exceeded the established control limits. However, the nitrate was not detected in any of the associated field samples above the reporting limit, therefore no qualification was required.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For some samples, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N, and orthophosphate; the analysis for pH and conductivity were exceeded by 2 and 22 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Beryllium, chromium, and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	Yes	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-10C-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample MMW-10C-T01N-GRW, pH class A, and was applicable for 1 out of 24 analytes. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-10A-T01N-GRW, and MMW-10A-T01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using these standards.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were no field quality control blanks. The field quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	No	Upon receipt of this sample delivery group (SDG), it was noticed that cyanide was accidentally not included in the results for the metals. Severn Trent Laboratories (STL)-Burlington subcontracted the cyanide samples to STL-North Canton due to malfunction in equipment that may have caused the samples to be analyzed outside of hold time. The results for cyanide have been submitted as a subcontracted data addendum following the WAT149A data.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)	Sulfate (mg/L)	Conductivity (umhos/cm)	pH
MMW-10A-T01N-GRW	4.8 J	0.005 UJ	0.028 J	---	2260 J	4.4 J
MMW-10C-T01N-GRW	2.2 J	0.005 UJ	0.01 UJ	---	1080 J	4.9 J
MMW-33A-T01N-GRW	2.6 J	---	---	---	1670 J	4.5 J
MMW-49A-T01N-GRW	2.7 J	---	0.021 J	935 J	1650 J	4.4 J
GWW-1-T01N-GRW	3.6 J	0.005 UJ	0.015 J	---	1510 J	4.7 J
GWW-2-T01N-GRW	3.3 J	0.005 UJ	0.022 J	---	1940 J	4.5 J
UPPER SPRING 39-T01N-GRW	0.78 J	0.005 UJ	0.01 UJ	---	760 J	5.9 J
LOWER SPRING 13-T01N-GRW	0.4 UJ	0.024 J	0.01 UJ	---	2180 J	3.9 J
SPRING 13 PUMP-T01N-GRW	0.4 UJ	---	0.01 UJ	913 J	1600 J	3.8 J
SPRING 39 PUMP-T01N-GRW	1.9 J	---	0.01 UJ	---	1540 J	4.8 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P) DF=10	0.3	0.3	0.3		0.2	MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, MMW-10C-T01N-GRW, MMW-10C-D01N-GRW, MMW-33A-T01N-GRW, MMW-33A-D01N-GRW, MMW-49A-T01N-GRW, MMW-49A-D01N-GRW, GWW-1-T01N-GRW, GWW-1-D01N-GRW, GWW-2-T01N-GRW, GWW-2-D01N-GRW, UPPER SPRING 39-T01N-GRW, UPPER SPRING-39-D01N-GRW, SPRING 13 PUMP-T01N-GRW, SPRING 13 PUMP-D01N-GRW, SPRING 39 PUMP-T01N-GRW, SPRING 39 PUMP-D01N-GRW	U CCB-I
Chromium (P) DF=100			-1.9		1.9	SPRING 13 PUMP-T01N-GRW, SPRING 13 PUMP-D01N-GRW, SPRING 39 PUMP-T01N-GRW, SPRING 39 PUMP-D01N-GRW	UJ CCB-L
Sodium (P) DF=100	1036.0	637.4		792.5	532.3	MMW-10C-D01N-GRW, MMW-49A-T01N-GRW, MMW-49A-D01N-GRW, GWW-1-T01N-GRW, GWW-1-D01N-GRW, GWW-2-T01N-GRW, GWW-2-D01N-GRW, LOWER SPRING 13-T01N-GRW, SPRING 13 PUMP-D01N-GRW	U CCB, MB-I

P=ICP MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT151C Sampling Event: July 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 9/22/03

Peer Reviewer: Larry Brook Date Completed: 10/11/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MMW-28A-T01N-GRW	SA	535519		W	X	X
MMW-28A-D01N-GRW	SA	535520		W	X	
MMW-29A-T01N-GRW	SA	535521		W	X	X
MMW-29A-D01N-GRW	SA	535522		W	X	
RB09T-GRW	RB	535523		W	X	X
MMW-32B-T01N-GRW	SA	535647		W	X	X
MMW-32B-D01N-GRW	SA	535648		W	X	
STORM 1-T01N-SFW	SA	535649		W	X	X
STORM 1-D01N-SFW	SA	535650		W	X	
RB02T-GRW	RB	535747		W	X	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted that the results for cyanide in sample RB02T-GRW were inadvertently not analyzed. The laboratory was unsuccessful in locating the sample, and therefore was unable to analyze the sample for cyanide. The client was contacted, and it was decided to report the RB02T-GRW sample in this case submittal without the results from cyanide.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample MMW-28A (pH=6.2) was logged in as a class "B" pH sample due to measurements taken at the laboratory. The sample STORM1-T01N/D01N-SFW was inadvertently written on the COC as STORM1-T01N/D01N-GRW. The client was contacted and the correction was made to reflect the proper field ID.
Holding Times	No	The following holding time issues were noted in the laboratory case narrative: • An accidental internal laboratory miscommunication regarding sample RB02T-GRW, caused the 7-day holding time for total suspended solids (TSS) and total dissolved solids (TDS) to be exceeded by 1-2 days, respectively. Also, the 14-day holding time was exceeded by 4 days for hydroxide, carbonate, bicarbonate , and total alkalinity. • The nitrate as N were accomplished 1 day beyond the 48-hour holding time due to a malfunction in the instrument that created a backlog in all of the samples. Also, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N, Nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 1-2 and 15-16 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, beryllium, cadmium, copper, iron, molybdenum, and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-28A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample MMW-28A-T01N-GRW, pH class C, and was applicable for 1 out of 24 analytes. Recovery for internal standards Li and Y were high for the ICPMS analysis of samples MMW-29A-T01N-GRW, MMW-29A-D01N-GRW, and RB02T-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using these standards. For sample MMW-28A-T01N/D01N-GRW the analysis of orthophosphate exceeded that of the total analysis of phosphorus beyond variation expected due to the accuracy limitations of the method. Table 1.3 summarizes these results and the data qualification.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB02T-GRW RB09T-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were a few various detections in the field quality control blanks (RB). Table 1.4 summarizes these detections. The field quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Hydro. Alkalinity (mg/L)	Carb. Alkalinity (mg/L)	Bicarb. Alkalinity (mg/L)	Total Alkalinity (mg/L)	TDS (mg/L)	TSS (mg/L)	Conductivity (umhos/cm)	pH
MMW-28A-T01N-GRW	0.62 J	0.005 UJ	0.12 J	---	---	---	---	---	---	871 J	6.2 J
MMW-29A-T01N-GRW	3.3 J	0.005 UJ	0.018 J	---	---	---	---	---	---	1440 J	5.0 J
RB09T-GRW	0.4 UJ	0.005 UJ	0.01 UJ	---	---	---	---	---	---	0.41 J	5.5 J
MMW-32B-T01N-GRW	0.4 UJ	0.005 UJ	0.045 J	---	---	---	---	---	---	2740 J	6.8 J
STORM1-T01N-SFW	---	---	---	---	---	---	---	---	---	675 J	7.0 J
RB03T-GRW	---	0.005 UJ	0.01 UJ	1.0 UJ	1.0 UJ	2.9 J	2.9 J	24 .0 J	0.5 UJ	0.01 J	7.4 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=10				49.1	-38.7	18.3	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, RB09T-GRW, MMW-32B-T01N-GRW, MMW-32B-D01N-GRW, STORM1-D01N-SFW, RB02T-GRW	UJ/J MB-L
							STORM1-T01N-SFW	UJ MB, CCB-L
Antimony (MS) DF=2					-1.0	0.5	All samples in this package.	UJ MB-L
Beryllium (P) DF=1	0.2	0.4	0.4		0.3	0.2	MMW-28A-T01N-GRW	U MB-I
Cadmium (P) DF=1	0.8	0.7	0.4		0.4	0.3	MMW-28A-T01N-GRW	U CCB-I
							MMW-28A-D01N-GRW, RB09T-GRW, MMW-32B-T01N-GRW, MMW-32B-D01N-GRW	U CCB, MB-I
Iron (P) DF=10			18.0	29.6		16.8	STORM1-T01N-SFW	U CCB-I
Molybdenum (P) DF=1	2.2	2.3		1.7		1.6	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, RB09T-GRW, MMW-32B-T01N-GRW, MMW-32B-D01N-GRW, RB02T-GRW	U CCB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Sodium (P) DF=10		-273.8		-378.1		218.8	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-29A-D01N-GRW, RB09T-GRW, RB02T-GRW	UJ/J CCB-L

MS=ICP-MS P=ICP MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Absolute Difference (mg/L)	RL (mg/L)	Evaluation Criteria	Action
MMW-28A-T01N-GRW				
Orthophosphate vs. Phosphorus	0.11	0.01	Evaluation criteria is met when the absolute difference is less than 2x RL	J/UJ TvP-I for sample MMW-28A-T01N-GRW

Table 1.4
Positive Results for Rinsate Blanks

Analyte	RB09T-GRW	RB02T-GRW
Total Dissolved Solids (mg/L)	1390	24
Bicarbonate Alkalinity (mg/L)	3.0	2.9
Total Alkalinity (mg/L)	3.0	2.9
Total Organic Carbon (mg/L)	1.0	---
Cadmium (µg/l)	0.33	---
Calcium (µg/l)	---	2510
Chromium (µg/l)	0.75	---
Manganese (µg/l)	---	17.8
Molybdenum (µg/l)	3.6	9.6

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT152A

Sampling Event: July 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 10/06/03

Peer Reviewer: Alan Roberts

Date Completed: 10/08/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MMW-42A-T01N-GRW	SA	535651		W	X	X
MMW-42A-D01N-GRW	SA	535652		W	X	
MMW-34B-T01N-GRW	SA	535653		W	X	X
MMW-34B-D01N-GRW	SA	535654		W	X	
P-1-T01N-GRW	SA	535655		W	X	X
P-1-D01N-GRW	SA	535656		W	X	
MMW-45B-T01N-GRW	SA	535657		W	X	X
MMW-45B-D01N-GRW	SA	535658		W	X	
MMW-27A-T01N-GRW	SA	535659		W	X	X
MMW-27A-D01N-GRW	SA	535660		W	X	
MMW-44A-T01N-GRW	SA	535661		W	X	X
MMW-44A-D01N-GRW	SA	535662		W	X	
P-2-T01N-GRW	SA	535663		W	X	X
P-2-D01N-GRW	SA	535664		W	X	
MMW-24-T01N-GRW	SA	535665		W	X	X
MMW-24-D01N-GRW	SA	535666		W	X	
MMW-17A-T01N-GRW	SA	535667		W	X	X
MMW-17A-D01N-GRW	SA	535668		W	X	
MMW-17B-T01N-GRW	SA	535669		W	X	X
MMW-17B-D01N-GRW	SA	535670		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the laboratory case narrative, the original nitrate as N analyses were accomplished within the prescribed analytical holding time of 48 hours. However, due to a malfunction of the instrument the nitrate as N sample MMW-24-T01N-GRW was re-analyzed at a dilution fifteen days beyond the holding time and reported. Also, the original sulfate results in samples MMW-44A-T01N-GRW, MMW-17A-T01N-GRW, and MMW-17B-T01N-GRW were compared to the historical data and shown to be inconsistent with previous samples. Therefore, sulfate was reanalyzed and reported for these three samples 33 days outside of the 28-day holding time. The 48-hour holding time was exceeded by less than 48 hours for nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 21 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Copper, nickel, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS MMW-27A-T01N-GRW MMW-27A-D01N-GRW • LD MMW-27A-T01N-GRW MMW-27A-D01N-GRW	No	Matrix spike analyses were conducted on samples MMW-27A-T01N-GRW and MMW-27A-D01N-GRW. Ten matrix spike results were outside acceptance limits. Table 1.3 summarizes these results and the data qualification issued. The matrix spike results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-27A-T01N-GRW MMW-27A-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample MMW-27A-T01N-GRW, pH class A, and was applicable for 4 out of 24 analytes. The serial dilution results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-34B-T01N-GRW, MMW-34B-D01N-GRW, P-1-T01N-GRW, P-1-D01N-GRW, MMW-45B-T01N-GRW, MMW-45B-D01N-GRW, MWW-44A-T01N-GRW, and MMW-44A-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using these standards. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exceptions of P-1-T/D01N-GRW (13.38%), P-2-T/D01N-GRW (13.30%,)MMW-17A-T/D01N-GRW (15.55%) and MMW-17B-T/D01N-GRW (16.23%), which agrees with the recalculated cation/anion balance. Four of the cation concentrations contributing to the calculation of this balance (Mg^{2+}, K^{+}, Na^{+}, and Al^{3+}) were not detected above the instrument detection limit (IDL) and were therefore reported at the detection limit. Recalculation of the balance, using ½ the concentration for Na+, which contributed significantly to this balance (25%meq/L), resulted in cation/anion balances of 3.90%, 4.64%, 5.47%, and 4.78%, respectively. The concentrations were low enough that reporting limits controlled the calculations. The balances were therefore not an appropriate measure of accuracy. No qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were no field quality control blanks. The field quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Sulfate (mg/L)	Conductivity (umhos/cm)	pH
MMW-42A-T01N-GRW	---	0.005 UJ	0.01 UJ	---	2570 J	3.8 J
MMW-34B-T01N-GRW	---	0.005 UJ	0.01 UJ	---	2860 J	4.7 J
P-1-T01N-GRW	---	---	---	---	1280 J	4.8 J
MMW-45A-T01N-GRW	---	---	---	---	2600 J	4.0 J
MMW-27A-T01N-GRW	---	0.005 UJ	0.03 J	---	2280 J	4.3 J
MMW-44A-T01N-GRW	---	---	---	2900 J	3330 J	4.3 J
P-2-T01N-GRW	---	---	---	---	968 J	4.7 J
MMW-24-T01N-GRW	49.5 J	---	0.01 UJ	---	3020 J	4.9 J
MMW-17A-T01N-GRW	---	0.005 UJ	0.01 UJ	387 J	733 J	4.7 J
MMW-17B-T01N-GRW	---	0.005 UJ	0.01 UJ	410 J	748 J	4.7 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Copper (P) DF=100		-7.1	-6.1		3.3	MMW-27A-T01N-GRW, MMW-27A-D01N-GRW, P-2-T01N-GRW, P-2-D01N-GRW, MMW-24-T01N-GRW, MMW-24-D01N-GRW, MMW-17A-T01N-GRW, MMW-17A-D01N-GRW, MMW-17B-T01N-GRW, MMW-17B-D01N-GRW	UJ/J CCB-L
Nickel (P) DF=100		-4.8	-4.8	-4.7	4.4	MMW-27A-T01N-GRW, MMW-27A-D01N-GRW, MMW-44A-T01N-GRW, MMW-44A-D01N-GRW, P-2-T01N-GRW, P-2-D01N-GRW, MMW-24-T01N-GRW, MMW-24-D01N-GRW, MMW-17A-T01N-GRW, MMW-17A-D01N-GRW, MMW-17B-T01N-GRW, MMW-17B-D01N-GRW	UJ/J CCB,MB-L
Zinc (P) DF=100	-1.7	-1.9	-1.7		1.6	MMW-17A-T01N-GRW, MMW-17A-D01N-GRW, MMW-17B-T01N-GRW, MMW-17B-D01N-GRW	J CCB-L

P=ICP MB = Method Blank CCBx-Continuing Calibration Blank DL = Instrument Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
MMW-27A-T01N-GRW					
Total Alkalinity	7.0	NA	75-125%	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery	No qualification
Chloride	132.1	NA		NONE	J MS-H parent
Sulfate	63.0	NA		NONE	J MS-L parent
TOC	131.3	NA		NONE	J MS-H parent
TKN	65.0	NA		NONE	UJ MS-L parent
Cobalt	133.4	NA		Nondetect	No qualification
Nickel	157.5	NA		Nondetect	No qualification
Cyanide	33.5	NA		NONE	UJ MS-L parent
MMW-27A-D01N-GRW					
Cadmium	142.4	NA	75-125%	Nondetect	No qualification
Cobalt	135.9	NA		Nondetect	No qualification

NA = Not appropriate

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT153A Sampling Event: July 2003

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 9/26/03

Peer Reviewer: Larry Brook Date Completed: 10/09/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MMW-21-T01N-GRW	SA	535700		W	X	X
MMW-21-D01N-GRW	SA	535701		W	X	
MMW-21-T01D-GRW	FD	535702		W	X	X
MMW-21-D01D-GRW	FD	535703		W	X	
MMW-38A-T01N-GRW	SA	535704		W	X	X
MMW-38A-D01N-GRW	SA	535705		W	X	
MMW-39A-T01N-GRW	SA	535706		W	X	X
MMW-39A-D01N-GRW	SA	535707		W	X	
MMW-7-T01N-GRW	SA	535708		W	X	X
MMW-7-D01N-GRW	SA	535709		W	X	
MMW-48A-T01N-GRW	SA	535710		W	X	X
MMW-48A-D01N-GRW	SA	535711		W	X	
MMW-22-T01N-GRW	SA	535712		W	X	X
MMW-22-D01N-GRW	SA	535713		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The metal analysis of laboratory control sample (LCS) yielded slightly high percent recovery (LCS=126.1%) of the target compound silver. The control limit for this compound is 75-125%. Since the LCS recovery was greater than the upper acceptance limit, all positive results for silver in all associated samples will be qualified as estimated ("J"), whereas nondetects results will be considered acceptable for use without qualification.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrite as N, and orthophosphate in sample MMW-48A-T01N-GRW. The 7-day holding time was exceeded by twelve days for total dissolved solids (TDS). The analysis for pH and conductivity were exceeded by 1-2 and 21-22 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, beryllium, and mercury were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-21-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample MMW-21-T01N-GRW, pH class A, and was applicable for 1 out of 24 analytes. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-38A-T01N-GRW, MMW-38A-D01N-GRW, MMW-39A-T01N-GRW, MMW-39A-D01N-GRW, MMW-7-T01N-GRW, and MMW-7-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard.
Field QC • Field Duplicate (FD) MMW-21-T01D-GRW MMW-21-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	All field duplicate results satisfied the evaluation criteria and data qualification was not necessary. The field quality control results for the July 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Conductivity (umhos/cm)	pH
MMW-21-T01N-GRW	---	---	---	---	2840 J	3.4 J
MMW-21-T01D-GRW	---	---	---	---	2870 J	3.4 J
MMW-38A-T01N-GRW	---	---	---	12800 J	6900 J	3.2 J
MMW-39A-T01N-GRW	---	---	---	5730 J	4380 J	4.5 J
MMW-7-T01N-GRW	---	---	---	11200 J	6700 J	4.2 J
MMW-48A-T01N-GRW	0.4 UJ	0.005 UJ	0.13 J	4310 J	3550 J	5.2 J
MMW-22-T01N-GRW	---	---	---	4620 J	3460 J	3.6 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P) DF=100		-33.4			-46.5	18.3	MMW-48A-T01N-GRW, MMW-48A-D01N-GRW	J MB-L
Beryllium (P) DF=10	-0.2				-0.2	0.2	MMW-48A-T01N-GRW, MMW-48A-D01N-GRW	UJ/J CCB, MB-L
Mercury (CV) DF=1				0.1		0.1	MMW-38A-T01N-GRW, MMW-38A-D01N-GRW, MMW-7-D01N-GRW, MMW-48A-D01N-GRW, MMW-22-T01N-GRW, MMW-22-D01N-GRW	U CCB-I

P=ICP CV = Cold Vapor MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit

RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT154C (Organics Only) Sampling Event: July 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Brian Olmsted Date Completed: 9/3/03

L.P Reviewer: Ansley Watson Date Completed: 2/18/04

Peer Reviewer: Stacey Coker Date Completed: 9/7/03 (SS), 2/22/4 (LPR)

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses		
					VOCs (8260)	SVOCs (8270 SIM) IM) SIM SIM	DRO (8015M)
MMW-48A-T01N-GRW	SA	535807	MMW48AT01NGRW	W	X	X	X
MMW-48A-T01D-GRW	SA	535810	MMW48AT01DGR	W	X	X	X
RB10T-GRW	RB	535808		W	X	X	X
FB02T-GRW	FB	535809		W	X	X	X
TB225-GRW	TB	535811		W	X		

Matrix: W = Water

QC Type: SA = Sample TB = Trip Blank FB = Field Blank RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

[3]Additional volume submitted for matrix QC analyses.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

These organic analyses were not required as part of the RI/FS QAPP and were conducted at the request of the client. The VOCs were analyzed by EPA method 8260, the SVOCs were analyzed by EPA method 8270 in the selective ion monitoring (SIM) mode, and TPH was analyzed by EPA method 8015M.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory noted that in order to accommodate field length limitations in processing the data summary forms, the laboratory did, in certain instances, abbreviate the sample identification. The electronically formatted data provides for the full sample identification.

The laboratory noted that manual integration was employed in deriving results for the volatile and semi-volatile organics analyses in this sample delivery group (SDG). The values that have been derived from

manual integration are qualified on the quantitation reports and extracted ion current profiles are included in the SDG.

The laboratory noted that the volatile analyses of the blank spikes associated with the samples in this delivery group yielded percent recoveries of select target analytes that exceeded control criteria. None of the affected compounds were detected in the associated field samples above the reporting limit. The reviewer verified that all analytes were non-detect in the associated samples. Therefore, no qualification was required as the suggested bias was high. It was noted that there were additional analytes that were recovered below the QC limits. Results for these analytes were accordingly qualified as estimated (UJ) with a low bias. Table 1.1 summarizes the LCS analytes recovered below acceptable criteria that resulted in qualification.

Reported sample concentrations between the method detection limit and the sample quantitation limit were qualified as "SQL" with an indeterminate bias.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	According to the laboratory log-in sheet, VOC samples for RB10T-GRW were sent, however, the chain of custody erroneously did not request VOC analysis. The VOA samples were logged in and analyzed by the lab. No data qualification was necessary and completeness was not affected by this inadvertent error on the COC form.
Holding Times	No	The 7 day collection to extraction holding time for all of the SVOC analyses was exceeded by 1 day resulting in qualification as estimated.
Method Blanks	No	Several analytes were detected in the volatile blank VBLKZ9. Due to the fact that all results for these analytes were non-detect in samples, no qualification was necessary.
Matrix QC • MS/MSD/PDS • LD	N/A	This package did not include any site-specific matrix quality control (QC) samples. The matrix quality control results for the July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate "Toluene-d8" was recovered in sample MMW-48A-T01D-GRW at 87.8% which rounds to 88% which is the lower limit of quality control (QC) established by the lab. In addition, sample MMW-48A-T01N-GRW recovered this surrogate at 95%. As such, it was not considered necessary to qualify the data on the basis of surrogate recoveries.
Field QC • Rinsate Blank RB01T-GRW • Field Blank FB02T-GRW • Trip Blank TB225-GRW	No	Several analytes were detected in the field quality control (QC) samples. Table 1.2 summarizes the detections found. The field quality control results for the July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	N/A	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Review Parameter	Criteria Met?	Comments
Laboratory-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	No	The drift in relative response factor for five analytes in one continuing calibration event for exceeded the maximum % difference of 25%. Table 1.3 summarizes the continuing calibration results that were outside the evaluation criteria and any resultant data qualification issues.
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	No	The volatile organic compounds analysis of laboratory control sample (LCS) and the laboratory control sample duplicate (LCSD) yielded a slightly high percent recovery of the target compounds acrolein (LCS=152%, LCSD=162%), acetone (LCS=154%, LCSD=164%), bromochloromethane (LCSD=110%), chloroform (LCSD=110%), 2-butanone (LCS=148%, LCSD=152%), chloroethane (LCS=120%), trans, 1,2-dichloroehtene (LCSD=110%), 4-Methyl-2-pentanone (LCSD=146%), 1,1,2,2,-Tetrachloroethane (LCS=110%, LCSD=110%), and vinyl acetate (LCS=180%, LCSD=170%), The CLP method does not require an LCS; however, the laboratory did report these values along with their historical QC limits of acrolein (60-140%), acetone (60-140%), bromochloromethane (73-107%), chloroform (74-106%), 2-butanone (60-140%), chloroethane (65-113%), trans, 1,2-dichloroehtene (77-109%), 4-Methyl-2-pentanone (60-140%), 1,1,2,2,-Tetrachloroethane (74-108%), and vinyl acetate (60-140%). Recoveries of these target compounds are considered acceptable in spite of being outside historic limits because the suggested bias is high and all samples results were nondetect. Therefore no qualifications were necessary. The volatile organic compounds analysis of laboratory control sample (LCS) and the laboratory control sample duplicate (LCSD) yielded a slightly low percent recovery of the target compounds tetrachloroethene (LCS=70%), and naphthalene (LCSD=76%). The laboratory has not yet established control limits for these compounds at this time; therefore the default ranges of 71-107% for tetrachloroethene and 78-130% for naphthalene were applied by the laboratory. Although the average LCS percent recoveries for tetrachloroethene were within acceptance limits, the tetrachloroethane and naphthalene results for all samples were qualified as estimated (UJ LCS-L) as a conservative measure (see Table 1.3).
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
LCS Recovery Results Not Meeting Acceptance Criteria and Data Qualification

Analyte	LCS and LCSD %R	QC Limits	Samples Qualified	Qualification and Qualification Codes
Tertachloroethene Naphthalene	70 and 79 100 and 76	71-107 78-130	All Samples	UJ LCS-L

Table 1.2
Positive Field QC Results Not Meeting Acceptance Criteria and Data Qualification

VOC Analyte	FB02T-GRW	RB10T-GRW	TB225-GRW	Qualification Codes
Chloroform (ug/L)	0.62	0.52	0.72	None. These analytes were not detected in the associated field samples.
Acetone (ug/L)	2.1	2.0	---	
SVOC Analyte	**FB02T-GRW**	**Qualification Codes**		
Phenanthrene (ug/L)	0.011	None. These analytes were not detected in the associated field samples.		
Fluoranthene (ug/L)	0.056			
Pyrene (ug/L)	0.058			
Benzo (a) anthracene	0.012			
Chrysene	0.042			
Benzo (b) fluoranthene	0.043			
Benzo (k) fluoranthene	0.037			
Indeno (1,2,3-cd) pyrene	0.026			
Dibenz (a,h) anthracene	0.022			
Benzo (g,h,i) perylene	0.028			

Table 1.3
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
7/29/03 (0735)	Acrolein Methyl Iodide Vinyl Acetate Tetrachloroethene tert-Butylbenzene	45.0% 37.3% 74.0% 38.9% 22.0%	Results for these analytes in associated samples were qualified as estimated.	UJ CCAL-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WATRAS4 Sampling Event: April and July 2003 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 1/16/04

Peer Reviewer: Stacey Coker Date Completed: 1/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses
					Aluminum, Arsenic, Cadmium
OUTFALL 002-D01N-GRW4	SA	556811		W	X
OUTFALL 002 WELL-D01N-GRW	SA	556812		W	X
OUTFALL 002 PIPE-D01N-GRW	SA	556813		W	X
OUTFALL 002-D01N-GRW7	SA	556814		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

The analytical results presented in the enclosed submittal represent re-analyses performed for OUTFALL samples collected in April and July. These samples were re-analyzed for aluminum, arsenic, and cadmium with no dilutions to achieve the lowest possible reporting limit.

A “4” suffix was added to sample OUTFALL 002-D01N-GRW to designate the sample collected in April collection date and “7” was added to the same sample Id to designate the sample collected in July.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 180-day holding time for aluminum, arsenic, and cadmium was exceeded by less than 95 days. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April and July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the individual events.
Method QC • Surrogates • Serial Dilution OUTFALL 002-D01N-GRW4 • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on sample OUTFALL 002-D01N-GRW4, pH class C, were applicable for 0 out of 3 analytes. The serial dilution results for the April and July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the individual events. Parent sample results were qualified on the basis of serial dilution results.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any site-specific field quality control samples. The field quality control results for the April and July 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the individual events.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Aluminum (µg/l)	Arsenic (µg/l)	Cadmium (µg/l)
OUTFALL002-D01N-GRW4	32.9 UJ	0.48 J	0.2 UJ
OUTFALL002WELL-D01N-GRW	32.9 UJ	0.49 J	0.31 J
OUTFALL002PIPE-D01N-GRW	32.9 UJ	0.42 J	0.54 J
OUTFALL002-D01N-GRW7	32.9 UJ	0.45 J	0.2 UJ

--- = Samples were within hold time; therefore no qualification was necessary.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: 98732 Sampling Event: July/August 2003 Reanalysis

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 3/17/04

Peer Reviewer: Stacey Coker Date Completed: 3/18/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Sulfate	TDS
RB05T-GRW	RB	561551		W	X	X
RB01T-GRW	RB	561552		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FB = Field Blank RB = Rinsate Blank TB = Trip Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Both samples were reanalyzed outside of holding time due to inconsistent results from the original submittals. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS • LD	NA	There were no matrix quality control samples in this SDG. The matrix quality control results for the July/August 2003 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution SC-7A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB01T-GRW RB05T-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	The rinsate blank results satisfied the applicable concentration-dependent evaluation criteria and data qualification was not necessary. The field quality control results for the July/August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Sulfate (mg/L)	TDS (mg/L)
RB05T-GRW	5.0 UJ	---
RB01T-GRW	---	5.0 UJ

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE AUGUST 2003 GROUNDWATER AND SURFACE WATER SAMPLING EVENT

Prepared for

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Questa, New Mexico

April 2004

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Project No. 22236241.00100

141426

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Summary of Reanalyses 2-1

Section 3 Data Review Process 3-1

Section 4 Data Review Commentary 4-1

4.1 Data Review Narratives 4-1
4.1.1 General Data Quality Issues 4-1
4.1.2 Dilution Schemes/Non-Detects With Elevated Rls 4-1
4.1.3 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 4-2
4.1.4 Non-Valid Matrix Spikes 4-2
4.1.5 Laboratory Performance Review (LPR) Findings 4-2

Section 5 Collective Summary/Assessment of Matrix QC Results 5-1

5.1 Matrix Spike Results (Accuracy Evaluation) 5-1
5.1.1 Groundwater Matrix Spike 5-2
5.1.2 Surface Water Matrix Spike 5-3
5.2 Laboratory Duplicates (Precision Evaluation) 5-4
5.2.1 Groundwater Laboratory Duplicate 5-4
5.2.2 Surface Water Laboratory Duplicate 5-5
5.3 Serial Dilution Results 5-5
5.3.1 Groundwater Serial Dilutions 5-5
5.3.2 Surface Water Serial Dilutions 5-6

Section 6 Collective Summary/Assessment of Field QC Results 6-1

6.1 Field Duplicate Samples 6-1
6.1.1 Groundwater Field Duplicate Results 6-2
6.1.2 Surface Water Field Duplicates Results 6-2
6.2 Rinsate Blank Results 6-3
6.2.1 Groundwater Rinsate Blanks 6-4
6.2.2 Surface Water Rinsate Blanks 6-5
6.3 Field Blank Results 6-5

Section 7 Overall Data Quality Indicator Assessment 7-1

7.1 Precision 7-1
7.2 Accuracy 7-1
7.3 Completeness 7-2
7.4 Representativeness 7-2

7.5 Comparability 7-3
7.6 Sensitivity 7-3

List of Tables

Table 1-1 Summary of Groundwater Samples Collected During August 2003 Sampling Event
Table 1-2 Summary of Surface Water Samples Collected During August 2003 Sampling Event
Table 2-1 Summary of Reanalysis for Groundwater August 2003 Sampling Event
Table 5-1 Field Samples Submitted for Matrix Spike
Table 5-2 Count of Matrix Spike Samples Collected in August 2003 Sampling Event
Table 5-3 Metals and Inorganic Matrix Spike Results for Groundwater Samples
Table 5-4 Inorganics Matrix Spike Results for Surface Water Samples
Table 5-5 Laboratory Duplicate Exceedances for Groundwater Samples
Table 5-6 ICP Serial Dilution Exceedances for Groundwater Samples
Table 5-7 ICP Serial Dilution Exceedances for Surface Water Samples
Table 6-1 Samples Submitted for Field Duplicate Analyses
Table 6-2 Field Duplicate Collection Frequency for the August 2003 Sampling Event
Table 6-3 Field Duplicate Exceedances for Groundwater Samples
Table 6-4 Field Duplicate Exceedances for Surface Water Samples
Table 6-5 Rinsate Blanks Collected During the August 2003 Sampling Event
Table 6-6 Rinsate Blank Collection Frequency for the August 2003 Sampling Event
Table 6-7 Summary of Groundwater Rinsate Blank Results and Additional Qualifications
Table 6-8 Summary of Surface Water Rinsate Blank Results and Additional Qualifications
Table 7-1 Summary of Precision Assessment for August 2003 Sampling Event
Table 7-2 Summary of Accuracy Assessment for August 2003 Sampling Event

List of Attachments

Attachment 1.1 Data Package WAT157C
Attachment 1.2 Data Package WAT158C
Attachment 1.3 Data Package WAT159A
Attachment 1.4 Data Package WAT160S

TABLE OF CONTENTS

Attachment 1.5 Data Package WAT161A

Attachment 1.6 Data Package WAT163C

Attachment 1.7 Data Package 98732

This data validation report (DVR) is intended to provide a general overview of the usability of the surface and ground water chemical data obtained during from the August 2003 sampling activities at Molycorp. In addition, this DVR is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

This report contains the results of the data validation conducted for groundwater and surface water samples collected in August of 2003 at the Molycorp Questa Mine, Questa, New Mexico. These water samples were collected in support of the Remedial Investigation/Feasibility Study (RI/FS). The water samples were sent to Severn Trent Laboratories (STL) Burlington in Colchester, VT. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods used and quality control samples collected were in accordance with the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). The results were reported in five original data packages and one reanalysis data packages.

The groundwater and surface water samples collected during the August 2003 sampling event and the associated chemical analyses are summarized in Table 1.1 and 1.2, respectively. Included in this table is the frequency of QC samples collected for each matrix.

Table 1-1
Summary of Groundwater Samples Collected During August 2003 Sampling Event

Sample Identification (Data Package)[1]	Dissolved Metals	Total Metals	Inorganics
MMW-10A-T01N-GRW (WAT159A)	X	X	X
MMW-17A-T01N-GRW (WAT161A)	X, MS, LD	X, MS, LD	X, MS, LD
MMW-17B-T01N-GRW (WAT161A)	X	X	X
MMW-27A-T01N-GRW (WAT161A)	X, RB	X, RB	X, RB
MMW-28A-T01N-GRW (WAT158C)	X, FD	X, FD	X, FD
MMW-29A-T01N-GRW (WAT161A)	X	X	X
MMW-31B-T01N-GRW (WAT157C)	X	X	X
MMW-33A-T01N-GRW (WAT159A)	X	X	X
MMW-42B-T01N-GRW (WAT163C)	X	X	X
MMW-44A-T01N-GRW (WAT161A)	X, RB	X, RB	X, RB
MMW-44B-T01N-GRW (WAT163C)	X	X	X
MMW-45A-T01N-GRW (WAT161A)	X, FD	X, FD	X, FD
MMW-45B-T01N-GRW (WAT161A)	X,	X	X
MMW-47A-T01N-GRW (WAT161A)	X	X	X
MMW-48A-T01N-GRW (WAT161A)	X	X	X
MMW-49A-T01N-GRW (WAT159A)	X	X	X
SPRING 13 PUMP-T01N-GRW (WAT159A)	X	X	X
SPRING 39 PUMP-T01N-GRW (WAT159A)	X	X	X
LOWER SPRING 13-T01N-GRW (WAT159A)	X	X	X
GWW-1-T01N-GRW (WAT159A)	X, MS, LD	X, MS, LD	X, MS, LD
GWW-2-T01N-GRW (WAT159A)	X	X	X
GWW-3-T01N-GRW (WAT159A)	X	X	X
MW-1-T01N-GRW (WAT157C)	X, MS, LD	X, MS, LD	X, MS, LD
MW-9A-T01N-GRW (WAT158C)	X	X	X
MW-17-T01N-GRW (WAT158C)	X	X	X
MW-20-T01N-GRW (WAT157C)	X	X	X

Table 1-1
Summary of Groundwater Samples Collected During August 2003 Sampling Event

Sample Identification (Data Package)[1]	Dissolved Metals	Total Metals	Inorganics
MW-21-T01N-GRW (WAT157C)	X	X	X
MW-22-T01N-GRW (WAT157C)	X	X	X
MW-23-T01N-GRW (WAT158C)	X	X	X
MW-24-T01N-GRW (WAT157C)	X	X	X
MW-25-T01N-GRW (WAT157C)	X	X	X
MW-26-T01N-GRW (WAT163C)	X	X	X
MW-27-T01N-GRW (WAT158C)	X, RB	X, RB	X, RB
MW-28-T01N-GRW (WAT158C)	X	X	X
MW-29-T01N-GRW (WAT158C)	X, FD	X, FD	X, FD
CC1A-T01N-GRW (WAT157C)	X	X	X
CC1B-T01N-GRW (WAT157C)	X	X	X
CC2A-T01N-GRW (WAT157C)	X	X	X
CC2B-T01N-GRW (WAT157C)	X	X	X
Number GW samples	39	39	39
Number MS/MSD or MS/LD	3	3	3
Number Field Duplicates	3	3	3
Number Rinsate Blanks	3	3	3

MS = Matrix Spike RB = Rinsate Blank FD = Field Duplicate GRW- Groundwater LD = Laboratory Duplicate

Notes:

[1] For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N."

Table 1-2
Summary of Surface Water Samples Collected During August 2003 Sampling Event

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics
RR-DS-SPRING13-T01N-SFW (WAT160S)	X, FD	X, FD	X, FD
RR-DS-SPRING39-T01N-SFW (WAT160S)	X	X	X
RR-US-SPRING13-T01N-SFW (WAT160S)	X, MS, LD	X, MS, LD	X, MS, LD
RR-US-SPRING39-T01N-SFW (WAT160S)	X, RB	X, RB	X, RB
Number SW samples	4	4	4
Number MS/MSD or MS/LD	1	1	1
Number Field Duplicates	1	1	1
Number Rinsate Blanks	1	1	1
Number Field Blanks	NA	NA	NA

DS = Downstream US = Upstream LD = Laboratory Duplicate

RB = Rinsate Blank FD = Field Duplicate SFW = Surface Water

Notes:

[1] For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N."

One rinsate blank from the August 2003 groundwater sampling event was reanalyzed for TDS and reported in a separate data package. The decision to reanalyze for TDS was due to the ratio of the measured TDS to the calculated TDS exceeding the acceptance range of 0.5 to 1.5. The result for the reanalysis yielded an acceptable TDS ratio and, as such, was retained as the final result. However, the remaining analyses were retained from the original data package. Table 2-1 summarizes the data packages in which the original and reanalysis results are reported.

Table 2-1
Summary of Reanalysis for Groundwater August, 2003 Sampling Event

Sample ID	Data Package	Parameters Retained for Final Data Set
RB01T-GRW	WAT170C	Total Metals, Dissolved Metals, Inorganics (minus TDS)
	98732	TDS (reanalysis)

The result for the reanalysis was reviewed in the same fashion as the original analyses. As a result of this review, the result obtained for reanalysis was selected for reporting and the original result was superseded.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, Inductively Coupled Plasma Spectroscopy (ICP) serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method, per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Section 4.0 includes the data review narratives for each of the data packages. In all cases of professional judgment exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative.

After completing the review sample-specific and laboratory performance parameters in accordance with SOP 12.1, the site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. The reason for this is that site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 5.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Where applicable, the potential direction of bias (high, low, or indeterminate) has been indicated on the tables in the text, and noted on the sample results sheets as H, L, or I, respectively. Section 6.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 7.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

4.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for the data packages included in this event. Due to sampling logistics, laboratory data packages may include samples of like matrix (water or solid), but with different sampling objectives (e.g., groundwater and surface water). In such circumstances, these samples were analyzed in conjunction with the respective event samples and are similarly affected by laboratory performance. Consequently, laboratory performance review findings may affect multiple events, separated by sampling objectives. As a result, individual data review summaries attached may include only a few samples included in this event and/or have performance findings affecting this event. In order to attain the frequency requirements for laboratory performance reviews, one data package WAT162C was evaluated for laboratory performance criteria. Although package WAT162C did not include groundwater samples form the routine monthly event, it did included groundwater samples from the Vegetable Garden Sampling Event, which occurred simultaneously.

Results of the laboratory performance reviews are summarized in the individual data review summary reports. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

4.1.1 General Data Quality Issues

During the data review process, several issues were identified which globally affected all relevant water samples analyzed for August 2003. Although these issues may have been addressed in the individual data review summary reports, it was considered necessary to summarize them in this data validation report.

4.1.2 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

During the course of the project, it became necessary to analyze surface water samples without dilution in order to obtain the lowest reporting limits possible. As such, surface water samples were analyzed without dilution rather than in accordance with a dilution scheme dictated by pH.

4.1.3 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

4.1.4 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

4.1.5 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 3.0. STL data package WAT162C was used to evaluate laboratory performance criteria. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated were found to be acceptable and no additional packages for this event were required to be assessed for performance parameters.

The site-specific matrix spike (MS) results, laboratory duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analysis, LD analyses, and the serial dilution results for the samples collected during the August 2003 sampling event.

Additional aliquots of three groundwater samples and one surface water sample were submitted for use in matrix QC analyses. Table 5-1 below summarizes the site-samples that were used to prepare matrix spike and matrix spike duplicate samples.

Table 5-1
Field Samples Submitted for Matrix Spike

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics
MMW-17A-T01N-GRW	Groundwater	WAT161A	x	x	x
MW-1-T01N-GRW	Groundwater	WAT157C	x	x	x
GWW-1-T01N-GRW	Groundwater	WAT159A	x	x	x
RR-US-SPRING 13-T01N-SFW	Surface water	WAT160S	x	x	x

[1] For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N."

Table 5-2 lists the groundwater MS/LD sample sets relative to the number of field samples.

Table 5-2
Count of Matrix Spike Samples Collected in August 2003 Sampling Event

Analyses	Number of MS samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	3	39	8
Dissolved Metals	3	39	8
Inorganics	3	39	8
SURFACE WATER			
Total Metals	1	4	25
Dissolved Metals	1	4	25
Inorganics	1	4	25

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

5.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results. A number of spike recoveries were outside of the QC acceptance limits of 75-125% for both inorganics and metals. In general, if less than a quarter of the valid spike recoveries (i.e., the sample concentration was no greater than four times the spike added) for a given analyte were outside of the acceptance range, only the parent sample results were qualified as estimated. If more than a quarter were outside of the acceptance range, the

results for that analyte in all samples of the same matrix may have been qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

5.1.1 Groundwater Matrix Spike

Although the majority of the groundwater matrix spike recoveries were within acceptance limits, some exceedances were observed. Table 5-3 summarize the inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added), and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 5-3
Metals and Inorganic Matrix Spike Results for Groundwater Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
TOTAL METALS					
Aluminum	2	0	0	100.2	
Antimony	3	0	0	103.0	
Arsenic	3	0	1	118.4	J MS-H for positive parent sample results
Barium	3	0	0	104.0	
Beryllium	3	0	0	109.3	
Boron	3	0	0	107.8	
Cadmium	3	0	0	106.0	
Chromium	3	1	0	87.2	J MS-L for parent sample results
Cobalt	3	0	0	101.3	
Copper	3	0	0	113.5	
Iron	1	0	0	123.6	
Lead	3	0	0	105.8	
Manganese	2	0	0	114.9	
Mercury	3	0	0	93.6	
Molybdenum	3	0	0	105.5	
Selenium	3	0	0	96.7	
Nickel	3	0	1	115.3	J MS-H for positive parent sample
Thallium	3	0	0	105.8	
Silver	3	0	2	120.9	J MS-H for all sample results
Vanadium	3	0	0	102.9	
Zinc	2	0	0	121.7	
Cyanide	3	0	0	89.4	
DISSOLVED METALS					
Aluminum	2	0	1	134.4	J MS-H for all positive sample results
Antimony	3	0	0	104.9	
Arsenic	3	0	0	104.2	
Barium	3	0	0	101.6	
Beryllium	3	0	0	106.6	
Boron	3	0	0	104.7	
Cadmium	3	0	0	109.3	
Chromium	3	0	0	97.3	
Cobalt	3	0	0	106.1	

Table 5-3
Metals and Inorganic Matrix Spike Results for Groundwater Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Copper	3	0	0	106.1	
Iron	1	0	0	94.0	
Lead	3	0	0	104.8	
Manganese	2	0	0	109.5	
Mercury	3	0	0	96.1	
Molybdenum	3	0	0	104.6	
Selenium	3	0	0	104.6	
Nickel	3	1	0	93.9	UJ/J MS-L for parent sample results
Thallium	3	0	0	104.7	
Silver	3	0	1	118.6	J MS-H for positive parent sample results
Vanadium	3	0	0	101.0	
Zinc	3	0	0	115.0	
INORGANICS[1]					
Chloride	3	0	0	92.5	
Nitrate	3	0	0	99.2	
Total ALK	1	0	0	103.6	
Fluoride	3	0	0	108.5	
Ammonia	3	0	0	81.7	
TKN	3	0	0	90.0	
Nitrite	3	0	0	100.0	
Ortho-P	3	0	0	98.2	
Phosphorus	3	0	0	101.2	
Sulfate	3	3	0	64.0	UJ/J MS-L all sample results
TOC	3	1	1	95.0	UJ/J MS-I all sample results

[1] MS recoveries for the bicarbonate and total alkalinity analyses are not an appropriate measure of accuracy due to the highly variable pH range (see Section 3.2.2). Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not used to assess the accuracy of the analysis.

For a few of the analytes listed in the table above, it was considered necessary to extend qualification to the balance of the August 2003 groundwater samples because more than a quarter of the spike results were outside evaluation criteria. Although results for some analytes were qualified based on matrix spike recoveries, none warranted rejection. Additionally, the vast majority (>97%) of matrix spike results were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

5.1.2 Surface Water Matrix Spike

Although the majority of the surface water matrix spike recoveries were within acceptance limits, exceedances were observed. All MS recoveries met criteria for total and dissolved metals. Table 5-4 summarize the inorganics MS results exceeding criteria, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 5-4
Inorganics Matrix Spike Results for Surface Water Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
INORGANICS					
Sulfate	1	0	0	51.5	UJ/J MS-L for all August SFW samples
COD	1	0	1	58.8	UJ/J MS-L for all August SFW samples
TOC	1	0	1	65	UJ/J MS-L for all August SFW samples

For each of the analytes listed in the table above, it was considered necessary to extend qualification to the balance of the August 2003 surface water samples due to the small data set and the magnitude of the exceedances. The vast majority (>97%) of matrix spike results were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

Post-Digestion Spikes

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the matrix spike exceedances were the result of sample matrix, and/or due to a bias in the analytical system. Recoveries for nearly all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

5.2 LABORATORY DUPLICATES (PRECISION EVALUATION)

The following subsections to the precision of analytical results based on their reproducibility. Section 5.2.1 discusses the metals and inorganic analyses for which precision was evaluated by the analysis of laboratory duplicates.

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion of ≤20% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs), which were used as the quantitative reporting limit.

5.2.1 Groundwater Laboratory Duplicate

With the following exceptions, all laboratory duplicate recoveries were within the laboratory acceptance limits. Table 5-5 below lists the groundwater laboratory duplicate results outside the laboratory acceptance limits and the result qualifiers applied.

Table 5-5
Laboratory Duplicate Exceedances for Groundwater Samples

Analyte (20% or 1xRL)	Sample ID	RPD or Difference	Frequency of Limit Exceedance	Action
METALS				
All results were within criteria				
INORGANICS				
TSS	MW-1-T01N-GRW	RPD = 28	1 of 3	J D-I for parent sample results.

The majority of laboratory duplicate results indicate overall acceptable precision. The TSS results for the parent sample MW-1-T01N-GRW was qualified as estimated on the basis of laboratory duplicate results.

5.2.2 Surface Water Laboratory Duplicate

All of the surface water laboratory duplicate recoveries were within the laboratory acceptance limits.

5.3 SERIAL DILUTION RESULTS

ICP serial dilutions are analyzed to help evaluate whether or not interferences exist due to sample matrix. When analyte concentrations are sufficiently high (defined as minimally 50x greater than the instrument detection limit [IDL]), the original results and five fold dilution are expected to agree within 10%. Otherwise interferences resulting in signal suppression or enhancement might be suspected.

The original and diluted sample results are compared by a percent difference (%D). When %Ds of ≤10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate than the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result.

5.3.1 Groundwater Serial Dilutions

Table 5-6 lists the number of applicable groundwater serial dilution results for analytes that exceeded criteria. With the exceptions noted in the table, all remaining %Ds between the original sample results and the result obtained from a five-fold diluted sample were ≤10%.

Table 5-6
ICP Serial Dilution Exceedances for Groundwater Samples

Analyte	Total Metals		Dissolved Metals	
	No. Valid Results	No. >10%	No. Valid Results	No. >10%
Aluminum	0	0	0	0
Antimony	0	0	0	0
Arsenic	0	0	0	0
Barium	3	0	3	0
Beryllium	3	0	3	0
Boron	1	0	1	0
Cadmium	1	0	1	0
Calcium	3	0	1	0
Chromium	1	0	1	0
Cobalt	1	0	1	0
Copper	1	0	1	0
Iron	1	0	0	0
Lead	1	0	1	0
Magnesium	1	0	1	0
Manganese	3	0	2	0
Molybdenum	4	0	3	0
Selenium	0	0	0	0
Nickel	1	0	1	0
Potassium	0	0	0	0
Thallium	0	0	0	0
Silver	1	0	1	0
Sodium	1	0	1	0
Vanadium	1	0	1	0
Zinc	1	0	0	0

The percent differences (%Ds) between the original sample results and the result obtained from a five-fold diluted sample were ≤10% for all analytes with applicable sample concentrations. Therefore, no qualifications of data were necessary.

5.3.2 SURFACE WATER SERIAL DILUTIONS

Table 5-7 the number of applicable groundwater serial dilution results for analytes that exceeded criteria. With the exceptions noted in the table, all remaining %Ds between the original sample results and the result obtained from a five-fold diluted sample were ≤10%.

Table 5-7
ICP Serial Dilution Exceedances for Surface Water Samples

Analyte	Number of Serial Dilution Samples Analyzed	Number of Valid Results	%Ds >10%	Avg. %Ds	Potential Bias Direction		Action
					Low	High	
Total Boron	1	1	1	10.7	1	0	J DL-L, parent (RR-US-SPRING 13-T01N-SFW) results only
Total Nickel	1	1	1	15.6	1	0	J DL-L, parent (RR-US-SPRING 13-T01N-SFW) results only
Dissolved Arsenic	1	1	1	16.2	1	0	J DL-L, parent (RR-US-SPRING 13-D01N-SFW) results only

[1]The table is limited to analytes for which the serial dilution results

The site-specific blanks (field and rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. Field duplicate agreement was assessed to determine the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. The following sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

6.1 FIELD DUPLICATE SAMPLES

Field duplicate samples were collected during this sampling event for metals and inorganics. Tables 6-1 and 6-2 below summarize the field duplicate samples collected and the frequency of field duplicate collection per analysis type, respectively.

Table 6-1
Samples Submitted for Field Duplicate Analyses

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics
MMW-28A-T01N-GRW/ MMW-28A-T01D-GRW	Groundwater	WAT158C	x	x	x
MW-29-T01N-GRW/MW-29-T01D-GRW	Groundwater	WAT158C	x	x	x
MMW-45A-T01N-GRW/ MMW-45A-T01D-GRW	Groundwater	WAT161A	x	x	x
RR-DS-SPRING 13-T01D-GRW	Surface Water	WAT160S	x	x	x

[1]For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N."

Table 6-2
Field Duplicate Collection Frequency for the August 2003 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	3	39	8
Dissolved Metals	3	39	8
Inorganics	3	39	8
SURFACE WATER			
Total Metals	1	4	25
Dissolved Metals	1	4	25
Inorganics	1	4	25

As shown on the above table, the 5% (or 1 in 20) frequency specification for field duplicates was met for the groundwater samples.

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion of ≤25% was applied for cases in which both the sample and sample duplicate concentration were greater than two times the RL as the reporting limit. For field duplicate pairs where the sample or

duplicate concentration was less than five times the reporting limits, the absolute difference between the sample and duplicate was compared to the criterion of two times the greater RL. For the metals analysis, the Contract Required Detection Limit (CRDL) was used as the RL for these evaluations even though the laboratory used the instrument detection limit (IDL) as the quantitative RL. With few exceptions, the applicable evaluation criterion was met. The exceptions and the resultant data qualifiers are summarized in the table below.

6.1.1 Groundwater Field Duplicate Results

The groundwater field duplicate sample results did not meeting acceptance criteria and resultant data qualification issued is summarized in Table 6-3 below.

Table 6-3
Field Duplicate Exceedances for Groundwater Samples

Sample ID	Analyte	RPD or Difference	Comment	Action
METALS				
MMW-28A-T01N-GRW MMW-28A-T01D-GRW	Nickel	Difference = 7.5 (ug/L)	1 out of 3	J/UJ FD-I for parent sample
INORGANICS				
MMW-28A-T01N-GRW MMW-28A-T01D-GRW	TDS	RPD = 54%	1 out of 3	J/UJ FD-I for parent sample

Qualification was limited to parent samples only because the frequency of outages was very low. The parent results were qualified as estimated with a potential low bias (J FD-I). The results were qualified as estimated with an indeterminate bias direction. Although some results were qualified based on field duplicate agreement, the vast majority (>99%) of the field duplicate results were within limits.

6.1.2 Surface Water Field Duplicates Results

The surface water field duplicate sample results did not meeting acceptance criteria and resultant data qualification issued is summarized in Table 6-4 below.

Table 6-4
Field Duplicate Exceedances for Surface Water Samples

Sample ID	Analyte	RPD or Difference	Comment	Action
METALS				
RR-DS-SPRING 13-T01N-SFW RR-DS-SPRING 13-T01D-SFW	Total Iron	RPD = 62.2%	1 out of 1	J/UJ FD-I for parent sample
INORGANICS				
All results were within criteria				

Data qualification for total iron was limited to the parent samples only because of the relatively minimal frequency (one pair) and magnitude of the exceedances. The total iron parent sample results were qualified as estimated with an indeterminate bias (J FD-I).

Although some results were qualified based on field duplicate agreement, the vast majority (>99%) of the field duplicate results were within limits.

6.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Table 6-5 and 6-6 lists the rinsate blanks that were collected during the August 2003 sampling event and the parameters for which they were analyzed.

Table 6-5
Rinsate Blanks Collected During the August 2003 Sampling Event

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics
RB01T-GRW (8/12/03 1620)	Groundwater	WAT163C	x	x	x
RB01T-GRW (8/12/03 1620)	Reanalysis Groundwater	98732			x
RB02T-GRW	Groundwater	WAT163C	x	x	x
RB03T-GRW	Groundwater	WAT158C	x	x	x
RB01T-SFW	Surface Water	WAT160S	x	x	x

[1] The "T" in the field ID was changed to "D" for dissolved metals samples.

Table 6-6
Rinsate Blank Collection Frequency for the August, 2003 Sampling Event

Analyses	Number of RB samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	3	39	8
Dissolved Metals	3	39	8
Inorganics	3	39	8
SURFACE WATER			
Total Metals	1	4	25
Dissolved Metals	1	4	25
Inorganics	1	4	25

The QAPP required frequency of 5% (1 per 20) for the collection of rinsate blanks was met for the August, 2003 water sampling event.

The rinsate blank detections results and the resulting data qualification issued are summarized in Tables 6-6. To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result which might bias the average low or biasing the average high by using the reporting limit.

6.2.1 Groundwater Rinsate Blanks

Table 6-7 summarizes the analytes detected in the associated RI/FS groundwater rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 6-7
Summary of Groundwater Rinsate Blank Results and Additional Qualifications

Analyte	Sample ID	Conc.	Avg. Conc.	RL	Frequency of Detection	Range for Field Samples	Action[1]
METALS (ug/l)							
Chromium	RB01T-GRW	27.4	9.93	1.1	3 of 3	0.6-190	All total chromium results <49.65 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW	11.5		1.1			
	RB03T-GRW	0.88		0.6			
Copper	RB01T-GRW	2.5	2.17	2.2	2 of 3	1.4-5830	All total copper results <10.85 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW	2.9					
Manganese	RB01T-GRW	14.6	7.2	7.0	1 of 3	16.7-42400	All total manganese results <36.0 mg/L were qualified as nondetect (U RB-I).
Molybdenum	RB01T-GRW	2.4	1.72	1.1	2 of 3	1.1-571	All total molybdenum results <8.6 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW	2.2					
Nickel	RB01T-GRW	11.3	4.57	2.4	1 of 3	2.0-961	All total nickel results <22.85 mg/L were qualified as nondetect (U RB-I).
INORGANICS (mg/L)							
Total Alkalinity and Bicarbonate Alkalinity	RB01T-GRW	2.8	2.7	1.0	3 of 3	1.0-563	All total alkalinity and bicarbonate alkalinity results <13.5 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW	2.5					
	RB03T-GRW	2.8					
TDS	RB01T-GRW	22	34	10	2 of 2	204-3420	All TDS results < 170 mg/L were qualified as nondetect (U RB-I). The TDS result from RB03T-GRW was rejected. The reanalysis result, reported in SDG 98732, was nondetect.
	RB02T-GRW	46					
	RB03T-GRW[2]	R					
Chloride	RB01T-GRW	0.47	0.223	0.2	1 of 3	2.0-80.1	All chloride results <2.35 mg/L were qualified as nondetect (U RB-I).
TOC	RB02T-GRW	1.3	0.767	1.0	1 of 3	1.0-3.3	None of the TOC results were greater than 5x the average rinsate blank concentration.
TSS	RB02T-GRW	0.8	0.7	0.5	2 of 3	0.8-115	All TSS results < 3.5 mg/L were qualified as nondetect (U RB-I).
	RB03T-GRW	0.8					

ND = Nondetect MDL = Method Detection Limit RL = Reporting Limit

[1]Criteria for qualification was based on 5x the average concentration found in the rinsate blanks.

[2] The reanalysis result was received after the analysis for the sampling event had been concluded. As such, the threshold for qualification was based on the two initially valid results.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

6.2.2 Surface Water Rinsate Blanks

Table 6-8 summarizes the analytes detected in the associated RI/FS surface water rinsate blank samples. Similarly as with the groundwater rinsate blanks, this table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 6-8
Summary of Surface Water Rinsate Blank Results and Additional Qualifications

Analyte	Sample ID	Conc.	Ave. Conc.	RL	Frequency of Detection	Range for Field Samples	Action[1]
INORGANICS (mg/L)							
Bicarbonate Alkalinity and Total Alkalinity	RB01T-SFW	2.8	2.8	1.0	1 of 1	26.6-76.2	None. All sample results were greater than the qualification threshold of ≤14 mg/L.
TDS	RB01T-SFW	40	40	10	1 of 1	194-360	All TDS results <200 mg/L were qualified as nondetect (U RB-I).
Phosphorus	RB01T-SFW	0.029	0.029	0.01	1 of 1	0.033-0.057	None of the phosphorus results were greater than 5x the average rinsate blank concentration.
Sulfate	RB01T-SFW	5.5	5.5	5.0	1 of 1	63.8-160	None. All sample results were greater than the qualification threshold of ≤27.5 mg/L.
Ammonia	RB01T-SFW	0.045	0.045	0.04	1 of 1	0.04-0.046	None of the ammonia results were greater than 5x the average rinsate blank concentration.

ND = Nondetect MDL = Method Detection Limit RL = Reporting Limit

[1]Criteria for qualification was based on 5x the average concentration found in the rinsate blanks.

[2]The reanalysis result was received after the analysis for the sampling event had been concluded. As such, the threshold for qualification was based on the two initially valid results.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

6.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field blanks were generated by pouring laboratory-supplied reagent grade water into certified pre-cleaned sample containers at the sample collection site. In accordance with the project QAPP, field blanks were only required for organic parameters. Therefore, no field blanks were required for the August 2003 Sampling Event.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory or rinsate blank contamination. In addition, some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summaries. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

7.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate results. Table 7-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 7-1
Summary of Precision Assessment for August 2003 Sampling Event

Analysis Type	QC Measure	# of Analytes Measured	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	FD	54	53	98
	LD	54	53	98
Total metals	FD	75	75	100
	LD	75	75	100
Dissolved Metals	FD	75	74	99
	LD	75	75	100
SURFACE WATER				
Inorganics	FD	20	20	100
	LD	20	20	100
Total metals	FD	25	24	96
	LD	25	25	100
Dissolved Metals	FD	25	25	100
	LD	25	25	100

The overall level of precision, both analytical and combined analytical and sampling demonstrated is considered to be acceptable.

7.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were

discovered upon review of laboratory performance parameters. The percent of MS recoveries meeting criteria are summarized in Table 7-2.

Table 7-2
Summary of Accuracy Assessment for August 2003 Sampling Event

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	MS	31	26	85
Total Metals	MS	61	56	96
Dissolved Metals	MS	59	56	95
SURFACE WATER				
Inorganics	MS	13	10	77
Total Metals	MS	22	22	100
Dissolved Metals	MS	21	21	100

The overall level of accuracy, both analytical and combined analytical and sampling demonstrated is considered to be acceptable.

7.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

There were 39 groundwater and 4 surface water samples collected during the August 2003 sampling event. All samples yielded valid results for all target analytes, consequently the completeness achieved was 100%.

7.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting Field Sampling Plan FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the biota samples. The close agreement between the field duplicate results, as discussed above in Section 6.1, indicates that the samples collected were adequately representative of the medium sampled.

Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. Again, the close agreement between duplicates noted in Section 5.1 indicates that sample processing and subsampling procedures were acceptable.

7.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

7.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. As such, obtaining some nondetect results with elevated reporting limits was not avoidable. While it is anticipated that all data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT157C

Sampling Event: Vegetable Garden

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Peggy Schuler

Date Completed: 10/30/03

Peer Reviewer: Kathie Teuscher

Date Completed: 11/06/03

The table below summarizes the results presented in this data package.

Field ID	Sample Date	QC Type	Lab ID	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
GARDEN1-T01N-IRW	08/06/2003	SA	537091	W	X	X	X	X
GARDEN1-D01N-IRW	08/06/2003	SA	537092	W	X			
GARDEN2-T01N-IRW	08/09/2003	SA	537356	W	X	X	X	X
GARDEN2-D01N-IRW	08/09/2003	SA	537357	W	X			
GARDENREF1-T01N-GRW	08/10/2003	SA	537358	W	X	X	X	X
GARDENREF1-D01N-GRW	08/10/2003	SA	537359	W	X			
MW-25-T01N-GRW	08/10/2003	SA	537360	W	X	X		
MW-25-D01N-GRW	08/10/2003	SA	537361	W	X			
MW-24-T01N-GRW	08/10/2003	SA	537362	W	X	X		
MW-24-D01N-GRW	08/10/2003	SA	537363	W	X			
MW-22-T01N-GRW	08/10/2003	SA	537364	W	X	X		
MW-22-D01N-GRW	08/10/2003	SA	537365	W	X			
MW-20-T01N-GRW	08/10/2003	SA	537366	W	X	X		
MW-20-D01N-GRW	08/10/2003	SA	537367	W	X			
MW-21-T01N-GRW	08/10/2003	SA	537368	W	X	X		
MW-21-D01N-GRW	08/10/2003	SA	537369	W	X			
MMW-31B-T01N-GRW	08/10/2003	SA	537370	W	X	X		
MMW-31B-D01N-GRW	08/10/2003	SA	537371	W	X			
MW-1-T01N-GRW	08/10/2003	SA	537372	W	X	X		
MW-1-D01N-GRW	08/10/2003	SA	537373	W	X			

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality, but not covered in the data review summary table below were noted in the case narrative.

Selected analyses were performed after the holding time had expired due to unforeseen delays in the delivery of samples via overnight courier. See "Holding Times" below.

The recovery of boron in one continuing calibration verification exceeded the upper limit of 110% at 111.2%. The positive boron result in associated sample MW-1-D01N-GRW was qualified as estimated with a possible high bias.

Review Parameter	Criteria Met?	Comments
Sample-specific *Parameters*	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	pH: Analyses of all samples were performed at least 40 hours after sample collection. According to both the QAPP and the method, pH should be analyzed "immediately." All results for pH were therefore qualified as estimated (J with indeterminate bias). Nitrate as N: Analyses of three samples were performed >48 hours, but <96 hours, after sample collection. The QAPP holding time for a water is 48 hours. The results for nitrate in these samples were therefore qualified as estimated (J/UJ with indeterminate bias). Specific samples and qualifiers are listed in Table 1.1. Nitrite as N: Analyses of six samples were performed >48 hours, but <96 hours, after sample collection. The QAPP holding time for a water is 48 hours. The results for nitrite in these samples were therefore qualified as estimated (J/UJ with indeterminate bias). One sample was analyzed greater than 96 hours after collection due to a laboratory oversight. The non-detect result for this sample was rejected (R). Specific samples and qualifiers are listed in Table 1.1. Orthophosphate as P: Analyses of six samples were performed >48 hours, but <96 hours, after sample collection. The QAPP holding time is 48 hours. The results for orthophosphate in these samples were therefore qualified as estimated (J/UJ with indeterminate bias). The analysis of one sample was performed greater than 96 hours after collection. The positive result for this sample was also qualified as estimated (J with indeterminate bias). Specific samples and qualifiers are listed in Table 1.1. Biochemical Oxygen Demand (BOD): Analysis of one sample was begun >48 hours, but <96 hours, after sample collection. The QAPP holding time is 48 hours. The non-detect result for BOD in this sample was therefore qualified as estimated (UJ with indeterminate bias). The analysis of another sample was begun greater than 96 hours after collection. The non-detect result for this sample was rejected (R). Specific samples and qualifiers are listed in Table 1.1.
Method Blanks	No	Various metals were detected in the metals preparation blanks and continuing calibration blanks. Table 1.2 summarizes the metals blank detections and the resultant data qualifications (limited to those analytes and samples requiring qualification). For positive blank results, the affected sample results were qualified as nondetect at the value reported (all results were reported relative to the IDL). For negative blank results, the affected results or detection limits were qualified as estimated.
Matrix QC GARDEN2-D01N-IRW GARDEN2-T01N-IRW MW-1-D01N-GRW MW-1-T01N-GRW • MS • PDS • LD	No	The matrix spike recoveries for sulfate in samples GARDEN2-T01N-IRW and MW-1-T01N-GRW were below the lower QC limit of 75% (70.5% and 60.4%, respectively). The sulfate results for the parent samples were therefore qualified as estimated (J with a low bias). The matrix spike recovery for total organic carbon (TOC) in sample MW-1-T01N-GRW exceeded the upper QC limit of 125%, at 130%. The TOC result in the parent sample was therefore qualified as estimated (J with a high bias).

Review Parameter	Criteria Met?	Comments
Sample-specific *Parameters*	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The matrix spike recovery for lead in sample GARDEN2-D01N-IRW exceeded the upper QC limit of 125% at 131%. However, lead was not detected in the parent sample. Therefore, no qualifications were required. The lab duplicate RPD for total suspended solids (TSS) exceeded the QC limit of 20%, at 28%. The TSS result in the parent sample was therefore qualified as estimated (J with an indeterminate bias). The matrix quality control results for the Vegetable Garden sampling event will be evaluated collectively and any additional data qualifications will be summarized in the overall assessment for the sampling event.
Method QC • Serial Dilution GARDEN2-D01N-IRW GARDEN2-T01N-IRW MW-1-D01N-GRW MW-1-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The method QC for the Vegetable Garden sampling event will be evaluated collectively and any resulting data qualifications will be summarized in the overall assessment for the sampling event.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank • Other (e.g. Splits)	N/A	No field duplicate pairs or blanks were submitted with this SDG. The field QC results for the Vegetable Garden sampling event will be evaluated collectively and any resulting data qualification will be summarized in the overall assessment for the sampling event.
Nondetect Results w/ Elevated RLs?	Yes	The ICP/MS analyses were performed at a 2-fold dilution. The adjusted instrument detection limits (IDLs were used as Reporting Limits for these samples) were still below the QAPP maximum reporting limits, so there is no effect on data usability.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results No samples contained concentrations of interferent elements comparable to those in the interference check samples (ICSs). As such, it was not necessary to evaluate any biases in sample results suggested by the results for the ICS A analyses.

Table 1.1
Holding Time Qualifications

Analytes	Qualified Samples	Qualification and Qualification Codes
pH	All Samples	J HT – I
Nitrate-N	GARDEN2-T01N-IRW MW-25-T01N-GRW MW-1-T01N-GRW	J HT - I or UJ HT - I

Analytes	Qualified Samples	Qualification and Qualification Codes
Nitrite-N	MMW-31B-T01N-GRW	R HT
	GARDEN2-T01N-IRW GARDENREF1-T01N-GRW MW-25-T01N-GRW MW-24-T01N-GRW MW-22-T01N-GRW MW-1-T01N-GRW	J HT - I or UJ HT - I
Orthophosphate-P	GARDEN2-T01N-IRW GARDENREF1-T01N-GRW MW-25-T01N-GRW MW-24-T01N-GRW MW-22-T01N-GRW MW-20-T01N-GRW MW-1-T01N-GRW	J HT - I or UJ HT - I
BOD	GARDEN2-T01N-IRW	R HT
	GARDENREF1-T01N-GRW	UJ HT - I

Table 1.2
Metal Blank Detections Resulting in Data Qualification

Analyte	CCBs (µg/L)	MB (µg/L)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Antimony	0.7 to 1.1		0.5	GARDEN1-T01N-IRW GARDEN2-D01N-IRW GARDEN2-T01N-IRW GARDENREF1-T01N-GRW	U CCB – I
Boron	6.1 to 7.2		4.6	GARDEN1-D01N-IRW GARDEN1-T01N-IRW MMW-31B-D01N-GRW MMW-31B-T01N-GRW MW-20-D01N-GRW MW-20-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW MW-24-D01N-GRW MW-24-T01N-GRW	U CCB – I
Beryllium	0.5 to 0.6		0.2	GARDEN2-D01N-IRW GARDEN2-T01N-IRW GARDENREF1-D01N-GRW GARDENREF1-T01N-GRW	U CCB – I
Copper	-2.0 to -1.9		1.4	GARDEN2-D01N-IRW GARDEN2-T01N-IRW GARDENREF1-D01N-GRW GARDENREF1-T01N-GRW	J/UJ CCB – L
Iron	20.8, 26.2		16.8	GARDEN1-T01N-IRW MW-20-T01N-GRW	U CCB – I
Lead	1.3 to 2	1.792	1.3	GARDEN2-T01N-IRW GARDENREF1-D01N-GRW GARDENREF1-T01N-GRW	U MB, CCB – I
Manganese	-2.2		1.9	MW-1-D01N-GRW	J CCB – L
Molybdenum	2.5		1.7	GARDEN2-D01N-IRW GARDEN2-T01N-IRW	U CCB – I

Analyte	CCBs (µg/L)	MB (µg/L)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Nickel	-2.6 to -2.1	-3.258	2.0	GARDEN1-D01N-IRW GARDEN1-T01N-IRW MW-1-D01N-GRW MW-1-T01N-GRW MW-20-D01N-GRW MW-20-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW MW-22-D01N-GRW MW-22-T01N-GRW MW-24-D01N-GRW MW-24-T01N-GRW MW-25-T01N-GRW	J/UJ MB – L
				GARDEN2-D01N-IRW GARDEN2-T01N-IRW GARDENREF1-D01N-GRW GARDENREF1-T01N-GRW	UJ CCB – L
Silver	-1.3 to -1		0.9	GARDEN1-D01N-IRW GARDEN1-T01N-IRW MMW-31B-D01N-GRW MMW-31B-T01N-GRW MW-1-D01N-GRW MW-1-T01N-GRW MW-20-D01N-GRW MW-20-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW MW-22-D01N-GRW MW-22-T01N-GRW MW-24-D01N-GRW MW-24-T01N-GRW MW-25-D01N-GRW MW-25-T01N-GRW	UJ CCB – L
Sodium	-1545 to 1072		532.3	MW-1-D01N-GRW	U CCB – I
				GARDEN2-D01N-IRW GARDEN2-T01N-IRW GARDENREF1-D01N-GRW GARDENREF1-T01N-GRW MMW-31B-D01N-GRW MMW-31B-T01N-GRW MW-1-T01N-GRW MW-20-D01N-GRW MW-20-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW	J/UJ CCB – L

Analyte	CCBs (µg/L)	MB (µg/L)	IDL (µg/L)	Samples Qualified	Qualification and Qualification Codes
Zinc	6.4 to 10.5	2.833	1.6	GARDEN1-D01N-IRW GARDEN1-T01N-IRW MW-20-D01N-GRW MW-20-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW MW-22-D01N-GRW MW-22-T01N-GRW MW-24-D01N-GRW MW-24-T01N-GRW MW-25-D01N-GRW MW-25-T01N-GRW	U CCB – I

For brevity, the table was limited to blank detections that resulted in data qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT158C

Sampling Event: August 2003 GRW/SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 10/22/03

Peer Reviewer: Stacey Coker

Date Completed: 02/01/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MW-29-T01N-GRW	SA	537374		W	X	X
MW-29-D01N-GRW	SA	537375		W	X	
MW-29-T01D-GRW	FD	537376		W	X	X
MW-29-D01D-GRW	FD	537377		W	X	
MMW-28A-T01N-GRW	SA	537572		W	X	X
MMW-28A-D01N-GRW	SA	537573		W	X	
MMW-28A-T01D-GRW	FD	537574		W	X	X
MMW-28A-D01D-GRW	FD	537575		W	X	
MW-17-T01N-GRW	SA	537576		W	X	X
MW-17-D01N-GRW	SA	537577		W	X	
MW-27-T01N-GRW	SA	537578		W	X	X
MW-27-D01N-GRW	SA	537579		W	X	
RB03T-GRW	RB	537580		W	X	X
MW-28-T01N-GRW	SA	537581		W	X	X
MW-28-D01N-GRW	SA	537582		W	X	
MW-23-T01N-GRW	SA	537583		W	X	X
MW-23-D01N-GRW	SA	537584		W	X	
MW-9A-T01N-GRW	SA	537585		W	X	X
MW-9A-D01N-GRW	SA	537586		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs, if any, are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables. However, the reviewer noted that one sample, MW-29-D01D-GRW (567377) was listed twice in the case narrative. This minor error has no effect on the quality or usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	In the case of samples MW-27-T01N-GRW, MW-28-T01N-GRW, MW-23-T01N-GRW, RB03T-GRW and MW-9A-T01N-GRW, the 48 hour hold time was unavoidably exceeded by 1 day for nitrate as N, nitrite as N, and orthophosphate due to the sample cooler arriving late at the laboratory. For all other samples, the coolers arrived within holding time, however, the 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 24 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Manganese, mercury, silver, sodium, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MW-29-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample MW-29-T01N-GRW, pH class C, and was applicable for 3 out of 24 analytes. The serial dilution results for the August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recoveries for internal standard Bi was low for the ICPMS analysis of samples RB03T-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard.
Field QC • Field Duplicate (FD) MW-29-T01D-GRW MW-29-D01D-GRW MMW-28A-T01D-GRW MMW-28A-D01D-GRW • Rinsate Blank (RB) RB03T-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package included two pairs of field duplicate (FD) samples. Two results for one pair were slightly outside the control criteria as summarized in Table 1.3. Also, there was one detection in the field quality control blanks (RB). It is summarized in Table 1.4. The field quality control results for the August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
MW-29-T01N-GRW	0.22 J	0.005 UJ	0.013 J	1660 J	7.3 J
MW-29-T01D-GRW	0.025 J	0.005 UJ	0.013 J	1700 J	7.3 J
MMW-28A-T01N-GRW	0.48 J	0.005 UJ	0.01 UJ	837 J	6.1 J
MMW-28A-D01N-GRW	0.49 J	0.005 UJ	0.01 UJ	843 J	6.1 J
MW-17-T01N-GRW	0.33 J	0.005 UJ	0.01 UJ	694 J	7.4 J
MW-27-T01N-GRW	0.66 J	0.005 UJ	0.016 J	376 J	7.5 J
RB03T-GRW	0.2 UJ	0.005 UJ	0.01 UJ	0.11 J	6.8 J
MW-28-T01N-GRW	0.28 J	0.083 J	0.01 UJ	1330 J	7.2 J
MW-23-T01N-GRW	1.0 J	0.005 UJ	0.01 UJ	464 J	7.9 J
MW-9A-T01N-GRW	0.48 J	0.005 UJ	0.013 J	1290 J	7.3 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples qualified	Qualification Code
Manganese (P) DF = 10		2.6		-2.4		1.9	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-28A-T01D-GRW, MMW-28A-D01D-GRW, MW-17-T01N-GRW, MW-17-D01N-GRW, MW-27-T01N-GRW, MW-27-D01N-GRW, RB03T-GRW, MW-23-T01N-GRW, MW-23-D01N-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW	UJ CCB-L or U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples qualified	Qualification Code
Mercury (CV) DF = 1			-0.1			0.1	MW-27-T01N-GRW, MW-27-D01N-GRW, RB03T-GRW, MW-28-T01N-GRW, MW-28-D01N-GRW, MW-23-T01N-GRW, MW-23-D01N-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW	UJ CCB-L
Silver (P) DF = 1				-0.9		0.9	MW-23-D01N-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW	UJ CCB-L
Sodium (P) DF = 10	763.5	954.6				532.3	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-28A-T01D-GRW, MMW-28A-D01D-GRW, MW-27-T01N-GRW, MW-27-D01N-GRW, MW-28-T01N-GRW, MW-23-T01N-GRW	U CCB-I
Zinc (MS) DF = 10					11.05	1.6	MW-29-T01N-GRW, MW-29-D01N-GRW, MW-29-T01D-GRW, MW-29-D01D-GRW, MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-28A-T01D-GRW, MMW-28A-D01D-GRW, MW-27-T01N-GRW, MW-27-D01N-GRW, MW-9A-D01N-GRW	U MB-I
Analyte					**MB (mg/l)**	**RL (mg/l)**	**Samples qualified**	**Qualification Code**
TSS DF = 1					0.5	0.5	MW-29-T01N-GRW, MW-29-T01D-GRW, MMW-28A-T01N-GRW, MMW-28A-T01D-GRW, RB03T-GRW, MW-28-T01N-GRW, MW-23-T01N-GRW, MW-9A-T01N-GRW	U MB-I

P = ICP MS = ICP-MS CV = Cold Vapor MB = method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	MMW-28A-T01N-GRW	MMW-28A-T01D-GRW	Criteria Comment	Outside Criteria	RL	Action
TDS (mg/l)	1140	676	RPD<30%	RPD = 54%	10	J FD-L parent
Nickel (µg/l)	9.5	2.0	Abs. Diff. <2xRL (i.e.≤ 4.0)	Abs Diff. = 7.5	2.0	J FD-L parent

Table 1.4
Positive Results for Rinsate Blanks

Analyte	RB03T-GRW
TDS (mg/L)	46.0
Bicarbonate Alkalinity (mg/L)	2.8
Total Alkalinity (mg/L)	2.8
Chromium (µg/l)	0.88

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT159A

Sampling Event: August 2003 GRW/SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 10/22/03

Peer Reviewer: Stacey Coker

Date Completed: 02/01/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
SPRING 39 PUMP-T01N-GRW	SA	537591	SPRING39PUMP-T01N-GR	W	X	X
SPRING 39 PUMP-D01N-GRW	SA	537592	SPRING39PUMP-D01N-G	W	X	
MMW-33A-T01N-GRW	SA	537593		W	X	X
MMW-33A-D01N-GRW	SA	537594		W	X	
MMW-49A-T01N-GRW	SA	537595		W	X	X
MMW-49A-D01N-GRW	SA	537596		W	X	
MMW-10A-T01N-GRW	SA	537597		W	X	X
MMW-10A-D01N-GRW	SA	537598		W	X	
SPRING 13 PUMP-T01N-GRW	SA	537599	SPRING13PUMP-T01N-GR	W	X	X
SPRING 13 PUMP-D01N-GRW	SA	537600	SPRING13PUMP-D01N-G	W	X	
GWW-2-T01N-GRW	SA	537601		W	X	X
GWW-2-D01N-GRW	SA	537602		W	X	
GWW-3-T01N-GRW	SA	537603		W	X	X
GWW-3-D01N-GRW	SA	537604		W	X	
GWW-1-T01N-GRW	SA	537605		W	X	X
GWW-1-D01N-GRW	SA	537606		W	X	
LOWERSPRING13-T01N-GRW	SA	537607	LOWERSPRNG13-T01N-G	W	X	X
LOWERSPRING13-D01N-GRW	SA	537608	LOWERSPRNG13-D01N-G	W	X	

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 24 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony, beryllium, copper, and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS GWW-1-T01N-GRW GWW-1-D01N-GRW • LD GWW-1-T01N-GRW GWW-1-D01N-GRW	No	Matrix spike analyses were conducted on samples GWW-1-T01N-GRW and GWW-1-D01N-GRW. Five matrix spike results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued. The matrix spike quality control results for the August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution GWW-1-T01N-GRWSL GWW-1-D01N-GRWSL • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analyses were conducted on the matrix spikes of samples GWW-1-T01N-GRW and GWW-1-D01N-GRW, pH class A, and were applicable for 4 out of 24 analytes for both samples. The serial dilution results for the August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For sample SPRING 13 PUMP-T01N-GRW the analysis of dissolved lead exceeded that of total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.4 summarizes these results and the data qualification. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exceptions of MMW-33A-T/D01N-GRW (13.23%) and GWW-3-T/D01N-GRW (14.44%). The reviewer was able to verify these reported ion balance results. Four of the cation concentrations contributing to the calculation of this balance (Ca^{2+}, K^{+}, Na^{+}, and Al^{3+}) were not detected above the dilution-adjusted instrument detection limit (IDL). Recalculation of the balance, using ½ the sample-specific detection limits for Ca^{2+}, which contributed significantly to the imbalances resulted in a cation/anion balances of 5.07% and 5.73%, respectively. The concentrations were low enough that reporting limits for nondetect results controlled the calculations. The balances were therefore not an appropriate measure of accuracy. No qualification was considered necessary.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	There were no field quality control blanks or samples in the sample delivery package. The field quality control sample results for the August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
SPRING 39 PUMP-T01N-GRW	1.9 J	0.005 UJ	0.01 UJ	14800 J	4.7 J
MMW-33A-T01N-GRW	2.9 J	0.005 UJ	0.015 J	1520 J	4.4 J
MMW-49A-T01N-GRW	3.2 J	0.005 UJ	0.027 J	1590 J	4.3 J
MMW-10A-T01N-GRW	5.1 J	0.005 UJ	0.028 J	2040 J	4.3 J
SPRING 13 PUMP-T01N-GRW	0.2 UJ	0.0066 J	0.01 UJ	1490 J	3.8 J
GWW-2-T01N-GRW	3.4 J	0.005 UJ	0.019 J	1700 J	4.3 J
GWW-3-T01N-GRW	3.4 J	0.005 UJ	0.029 J	1670 J	4.4 J
GWW-1-T01N-GRW	3.8 J	0.005 UJ	0.016 J	1380 J	4.6 J
LOWER SPRING 13-T01N-GRW	0.2 UJ	0.005 UJ	---	1920 J	3.6 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples qualified	Qualification Code
Antimony (P) DF = 10			3.9		4.294	3.8	GWW-1-T01N-GRW	U CCB, MB-I
Beryllium (P) DF = 10	-0.4	-0.2	-0.4		-0.467	0.2	SPRING 39 PUMP-T01N-GRW, SPRING 39 PUMP-D01N-GRW, MMW-33A-T01N-GRW, MMW-33A-D01N-GRW, MMW-49A-T01N-GRW, MMW-49A-D01N-GRW,	J CCB, MB-L

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples qualified	Qualification Code
							MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, SPRING 13 PUMP-T01N-GRW, SPRING 13 PUMP-D01N-GRW, GWW-2-T01N-GRW, GWW-2-D01N-GRW, GWW-3-T01N-GRW, GWW-3-D01N-GRW, GWW-1-T01N-GRW, GWW-1-D01N-GRW	
Copper (P) DF = 100	4.0					3.3	MMW-33A-T01N-GRW, MMW-33A-D01N-GRW, MMW-49A-T01N-GRW, MMW-49A-D01N-GRW, MMW-10A-T01N-GRW, MMW-10A-D01N-GRW	U CCB-I
Sodium (P) DF = 100		-566.9		-918.6	-1441.0	532.3	All samples in this SDG.	UJ CCB, MB-L

P = ICP MS = ICP-MS CV = Cold Vapor MB = method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results And Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
GWW-1-T01N-GRW					
Total Alkalinity	20.3	NA		Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery. Spike recovery therefore is not considered to be an appropriate indication of accuracy.	No qualification
Sulfate	67.9	NA		NONE	J MS-L parent sample
Chromium	68.9	107.5	75-125%	NONE	UJ MS-L parent sample
Nickel	133.0	107.5		Parent sample is nondetect; suggested bias is high	No qualification
Silver	126.5	81.0		Parent sample is nondetect; suggested bias is high	No qualification
GWW-1-D01N-GRW					
Nickel	63.3	103.4		NONE	J MS-L parent sample

NA = Not appropriate

Table 1.4
Total vs. Dissolved Qualifications for Metals

Sample/Analytes	Absolute difference	RL (µg/l)	Evaluation Criteria	Action
SPRING 13 PUMP-T01N/D01N-GRW				
Lead	3.1	1.0	Absolute difference >2x RL (i.e.>2.0)	J TvP-I for samples SPRING 13 PUMP-T01N-GRW and SPRING 13 PUMP -D01N-GRW.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT160S

Sampling Event: August 2003 SFW and Storm Event #2

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 10/03/03

Peer Reviewer: Stacey Coker

Date Completed: 11/10/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
RR-US-SPRING 39-T01N-SFW	SA	537611	RR-US-SPRG39-T01N-SF RR-US-SPRG39-T01N-SFW	W	X	X	X	X
RR-US-SPRING 39-D01N-SFW	SA	537612	RR-US-SPRG39-D01N-SF RR-US-SPRG39-D01N-SFW	W	X			
RB01T-SFW	RB	537613		W	X	X	X	X
RR-US-SPRING 13-T01N-SFW	SA	537614	RR-US-SPRG13-T01N-SF RR-US-SPRG13-T01N-SFW	W	X	X	X	X
RR-US-SPRING 13-D01N-SFW	SA	537615	RR-USSPRG13-D01N-SF RR-USSPRG-13-D01N-SFW	W	X			
RR-DS-SPRING 39-T01N-SFW	SA	537616	RR-DS-SPRG39-T01N-SF RR-DS-SPRG39-T01N-SFW	W	X	X	X	X
RR-DS-SPRING 39-D01N-SFW	SA	537617	RR-DS-SPRG39-D01NSF RR-DS-SPRG39-D01NSFW	W	X			
RR-DS-SPRING 13-T01N-SFW	SA	537618	RR-DS-SPRG13-T01N-SF RR-DS-SPRG13-T01N-SFW	W	X	X	X	X
RR-DS-SPRING 13-D01N-SFW	SA	537619	RR-DS-SPRG13-D01N-SF RR-DS-SPRG13-D01N-SFW	W	X			
RR-DS-SPRING 13-T01D-SFW	FD	537620	RR-DS-SPRG13-T01D-SF RR-DS-SPRG13-T01D-SFW	W	X	X	X	X
RR-DS-SPRING 13-D01D-SFW	FD	537621	RR-DS-SPRG13-D01D-SF RR-DS-SPRG13-D01D-SFW	W	X			
ISCO-LR-16-T01N-SFW	SA	538090		W	X	X		
ISCO-LR-16-D01N-SFW	SA	538091		W	X			
ISCO-LR-16-T02N-SFW	SA	538092		W	X	X		
ISCO-LR-16-D02N-SFW	SA	538093		W	X			
ISCO-LR-16-T03N-SFW	SA	538094		W	X	X		
ISCO-LR-16-D03N-SFW	SA	538095		W	X			

Matrix: W = Water
QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The laboratory case narrative noted the original Total Dissolved Solids (TDS) analyses of all samples in this delivery group, performed within the prescribed analytical holding time of 7 days, resulted in net weights after drying that were in excess of the upper limit of the method (160.1). Upon review of the raw data sheets, it was verified that only sample RR-DS-SPRING39-T01N-SFW yielded a net weight in excess of the method specified weight limit. Accordingly, only this sample was reanalyzed, using a reduced sample volume. The reanalyzed reported TDS result was comparable with the original TDS result.

In addition, the laboratory case narrative noted samples RR-DS-SPRING39-T01N-SFW, RR-DS-SPRING13-T01N-SFW, and RR-DS-SPRING13-T01D-SFW were received two days after their collection, within hours of the expiration of the 48 hour holding time for nitrate (in addition to nitrite, orthophosphate, and BOD_5). The nitrate sequence for these samples was initiated the day they were received, however the auto-sampler did not inject them until after midnight, thereby recording the nitrate analysis date as 08/14/03. Regardless, all nitrate results for samples collected on 08/11/03 and presented with this data package were qualified as estimated (J/UJ), as summarized in the table.

The case narrative presented by the laboratory commented on the elevated replicate percent difference for TOC (22%). However, due to the fact that neither TOC concentration was in excess of the reporting limit, the difference between the two reported concentrations was compared to an evaluation criterion of ≤ 1xRL. Accordingly, no qualification was necessary on the basis of laboratory duplicate results.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As mentioned in the case narrative summary, the TDS result for sample RR-DS-SPRING39-T01N-SFW was qualified as estimated (J), as the reported result was analyzed 15 days beyond the prescribed analytical holding time of 7 days. The majority of nitrate, nitrite, orthophosphate, and BOD_5 analyses were performed several hours beyond the prescribed analytical holding time of 48 hours, and were accordingly qualified as estimated. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 21 days beyond log-in. The pH for all samples was measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD RR-US-SPRING13-T01N-SFW RR-US-SPRING13-D01N-SFW • LD RR-US-SPRING13-T01N-SFW RR-US-SPRING13-D01N-SFW	No	Total Alkalinity, sulfate, COD and TOC were recovered outside the acceptance limits of 75-125% in the matrix spike analysis of sample RR-US-SPRING13-T01N-SFW. Table 1.3 summarizes the matrix spike detections along with the qualifications assigned to the parent sample. The matrix quality control results for the August 2003 SFW and Storm Event #2 will be evaluated collectively and any resultant data qualification will be summarized in the individual overall assessments for these two events.
Method QC • Surrogates • Serial Dilution (C) RR-US-SPRING13-T01N-SFW RR-US-SPRING13-D01N-SFW • Total vs. Partial Analyses	No	Two serial dilution tests were conducted on matrix spike samples RR-US-SPRING13-T01N-SFW and RR-US-SPRING13-D01N-SFW. The serial dilution results could not be used to assess potential interferences for four of the 24 metals analyzed by ICP since 20 analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. Table 1.4 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The molybdenum concentration of 38.3 µg/L in the filtrate (dissolved) sample ISCO-LR-16-D01N-SFW was greater than the molybdenum concentration of 53.1 µg/L in the corresponding total metals sample, ISCO-LR1-6-T01N-SFW. Due to the fact that both values are greater than 5x the RL (run at a straight analysis), the percent difference between the two results is compared to an evaluation criterion of 30%. The partial concentration is 64.7 % greater than the total concentration. Accordingly, the molybdenum results for both samples were qualified as estimated (J) with an indeterminate direction of bias.
Field QC • Field Duplicate RR-DS-SPRING13-T01N/T01D-SFW RR-DS-SPRING13-D01D/D01N-SFW • Rinsate Blank • RB01T-SFW • Field Blank • Trip Blank	No	The iron results for samples RR-DS-SPRING13-T01D-SFW and RR-DS-SPRING13-D01D-SFW were qualified as estimated due to field duplicate disagreement. Table 1.5 summarizes the detections and resultant qualifications. The field QC results for the August 2003 SFW and Storm Event #2 will be evaluated collectively and any resultant data qualification will be summarized in the individual overall assessments for these events.
Nondetect Results w/ Elevated RLs?	N/A	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (N) (mg/L)	Nitrite (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	PH (std units)	BOD_5 (mg/L)	TDS (mg/L)
RR-DS-SPRING39-T01N-SFW	0.55 J	0.0050 UJ	0.10 UJ	313 J	6.3 J	1.4 UJ	---
RB01T-SFW	0.20 UJ	0.0050 UJ	---	0.11 J	5.7 J	1.4 UJ	---
RR-US-SPRING13-T01N-SFW	0.36 J	0.0050 UJ	0.010 UJ	328 J	7.5 J	1.4 UJ	---
RR-DS-SPRING39-T01N-SFW	0.35 J	0.0050 UJ	0.010 UJ	313 J	7.5 J	1.4 UJ	290 J
RR-DS-SPRING13-T01N-SFW	0.39 J	0.0050 UJ	0.010 UJ	332 J	7.5 J	1.4 UJ	---
RR-DS-SPRING13-T01D-SFW	0.38 J	0.0050 UJ	0.010 UJ	334 J	7.5 J	1.4 UJ	---
ISCO-LR-16-T01N-SFW	---	---	---	410 J	8.1 J	---	---
ISCO-LR-16-T02N-SFW	---	---	---	411 J	8.0 J	---	---
ISCO-LR-16-T03N-SFW	---	---	---	415 J	8.0 J	---	---

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Chromium (P)	-2.1	-2.2	-2.2	-2.0	-2.070		All samples	UJ MB,CCB-L
Mercury (CV)	-0.1	---	---	---	---	0.1	ISCO-LR-16-D01N-SFW ISCO-LR-16-D02N-SFW ISCO-LR-16-D03N-SFW ISCO-LR-16-T01N-SFW ISCO-LR-16-T02N-SFW ISCO-LR-16-T03N-SFW	UJ CCB-L
Molybdenum (MS)	0.5	---	---	---	---	0.3	RR-US-SPRING13-T01N-SFW RR-US-SPRING39-D01N-SFW RR-US-SPRING39-T01N-SFW	U CCB-I

MS = ICP-MS P = ICP CCBx-Continuing Calibration Blank RL = IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.
*CCB1 and CCB2 results were not associated with any of the samples analyzed in this data package and were therefore not included in this table.

Table 1.3
Matrix Spike Results And Parent Sample Qualifications

Analyte	MS%R or MS/MSD %Rs	PDS %R	Criteria	Action
RR-US-SPRING13-T01N-SFW				
Total Alkalinity	141.9	N/A	75-125	J MS-H parent
Sulfate	51.5			J MS-L parent
Chemical Oxygen Demand	58.8			J MS-L parent
Total Organic Carbon	65.0			J MS-L parent

NA = Not appropriate FD = Field Duplicate

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification
RR-US-SPRING13-T01N-SFW		
Cadmium	10.7	J DL-L parent
Nickel	15.6	J DL-L parent
RR-US-SPRING13-D01N-SFW		
Arsenic	16.2	UJ DL-L parent

Table 1.5
Field Duplicate Concentrations Resulting in Qualification

Sample	Original Iron (µg/L)	Duplicate Iron (µg/L)	Qualification Code
RR-DS-SPRING13-T01N/T01D-SFW	452	860	J FD-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT161A

Sampling Event: August 2003 GRW/SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 10/28/03

Peer Reviewer: Stacey Coker

Date Completed: 11/07/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MMW-17A-T01N-GRW	SA	537644		W	X	X
MMW-17A-D01N-GRW	SA	537645		W	X	
MMW-17B-T01N-GRW	SA	537646		W	X	X
MMW-17B-D01N-GRW	SA	537647		W	X	
MMW-45B-T01N-GRW	SA	537648		W	X	X
MMW-45B-D01N-GRW	SA	537649		W	X	
MMW-29A-T01N-GRW	SA	537650		W	X	X
MMW-29A-D01N-GRW	SA	537651		W	X	
MMW-45A-T01N-GRW	SA	537652		W	X	X
MMW-45A-D01N-GRW	SA	537653		W	X	
MMW-45A-T01D-GRW	FD	537654		W	X	X
MMW-45A-D01D-GRW	FD	537655		W	X	
MMW-47A-T01N-GRW	SA	537816		W	X	X
MMW-47A-D01N-GRW	SA	537817		W	X	
MMW-44A-T01N-GRW	SA	537818		W	X	X
MMW-44A-D01N-GRW	SA	537819		W	X	
MMW-48A-T01N-GRW	SA	537820		W	X	X
MMW-48A-D01N-GRW	SA	537821		W	X	
MMW-27A-T01N-GRW	SA	537822		W	X	X
MMW-27A-D01N-GRW	SA	537823		W	X	

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The 7-day holding time was exceeded by 3 days for TOC due to a malfunction of the TOC analyzer. The analysis for pH and conductivity were exceeded by 2 and 24 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, arsenic, mercury, molybdenum, sodium, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS MMW-17A-T01N-GRW MMW-17A-D01N-GRW • LD MMW-17A-T01N-GRW MMW-17A-D01N-GRW	No	Matrix spike analyses were conducted on samples MMW-17A-T01N-GRW and MMW-17A-D01N-GRW. Seven matrix spike results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued. The matrix spike quality control results for the August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-17A-T01N-GRW MMW-17A-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the matrix spikes of samples MMW-17A-T01N-GRW and MMW-17A-D01N-GRW, pH class A, and both were applicable for 3 out of 24 analytes. The serial dilution results for the August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recoveries for internal standard Y was low for the ICPMS analysis of samples MMW-45B-T01N-GRW, MMW-45B-D01N-GRW, MMW-45A-T01N-GRW, MMW-45A-D01N-GRW, MMW-45A-T01D-GRW, MMW-45A-D01D-GRW, MMW-44A-T01N-GRW, and MMW-44A-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. For sample MMW-48A-T01N-GRW/MMW-48A-D01N-GRW, the analysis of dissolved calcium, iron, magnesium, manganese, and zinc exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.4 summarizes these results and the data qualification. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exceptions of MMW-17A-T/D01N-GRW (13.10%), MMW-17B-T/D01N-GRW (17.46%), MMW-47A-T/D01N-GRW (14.63%), and MMW-44A-T/D01N-GRW (16.0%). The reviewer verified the reported ion balance numbers. Four of the cation concentrations contributing to the calculation of these balances (Ca^{2+}, K^{+}, Na^{+}, and Al^{3+}) were not detected above the instrument detection limit (IDL) and were therefore reported at the detection limit. Recalculation of the balance, using ½ of the reporting limit for Ca^{2+}, which contributed significantly to the imbalances resulted in cation/anion balances of 0.95%, 5.26%, 3.68%, and 9.35%, respectively. As such the reporting limits for nondetect results limits controlled the calculations. The balances were therefore not an appropriate measure of accuracy. No qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) MMW-45A-T01D-GRW MMW-45A-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package included field duplicate (FD) samples for which results for one analyte were slightly outside the control criteria as summarized in Table 1.5. The field quality control results for the August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TOC (mg/L)	Conductivity (umhos/cm)	pH
MMW-17A-T01N-GRW	5.8 J	0.005 UJ	0.01 UJ	---	672 J	4.2 J
MMW-17B-T01N-GRW	0.21 J	0.005 UJ	---	---	671 J	4.4 J
MMW-45B-T01N-GRW	0.2 UJ	0.005 UJ	---	---	2390 J	3.9 J
MMW-29A-T01N-GRW	3.5 J	0.005 UJ	0.013 J	---	1310 J	4.6 J
MMW-45A-T01N-GRW	0.2 UJ	0.005 UJ	---	---	1910 J	3.5 J
MMW-45A-T01D-GRW	0.2 UJ	0.005 UJ	---	---	1920 J	3.5 J
MMW-47A-T01N-GRW	1.4 J	0.005 UJ	0.01 UJ	1.1 J	945 J	5.0 J
MMW-44A-T01N-GRW	0.35 J	0.005 UJ	0.046 J	2.4 J	3080 J	3.5 J
MMW-48A-T01N-GRW	0.2 UJ	0.005 UJ	0.01 J	2.7 J	3300 J	5.1 J
MMW-27A-T01N-GRW	4.6 J	0.005 UJ	---	1.6 J	2070 J	4.3 J

--- = Samples were analyzed within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples qualified	Qualification Code
Aluminum (P) DF = 100			48.6		23.6	MMW-47A-T01N-GRW, MMW-47A-D01N-GRW, MMW-48A-T01N-GRW	U CCB-I
Arsenic (P) DF = 10	4.5		3.8		2.4	MMW-17A-D01N-GRW, MMW-45A-T01D-GRW, MMW-45A-D01D-GRW, MMW-47A-T01N-GRW, MMW-47A-D01N-GRW, MMW-44A-T01N-GRW, MMW-44A-D01N-GRW, MMW-48A-T01N-GRW, MMW-48A-D01N-GRW, MMW-27A-T01N-GRW, MMW-27A-D01N-GRW	U CCB-I
Mercury (CV) DF = 1	-0.1				0.1	MMW-47A-T01N-GRW	UJ CCB-L
Molybdenum (P) DF = 10	2.1				1.6	MMW-17A-T01N-GRW	U CCB-I
Sodium (P) DF = 100				484.4	472.7	MMW-48A-D01N-GRW	U MB-I
Zinc (P) DF = 100				3.9	1.0	MMW-17A-T01N-GRW, MMW-17A-D01N-GRW, MMW-17B-T01N-GRW, MMW-17B-D01N-GRW	U MB-I

P = ICP MS = ICP-MS CV = Cold Vapor MB = method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results And Parent Sample Qualifications

Analyte	MS% R	PDS %R	Criteria	Comment	Action
MMW-17A-T01N-GRW					
Total Alkalinity	41.2	NA	75-125%	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery; the matrix spike recovery is not considered to be a valid indication of accuracy.	No qualification
Sulfate	63.8	NA		NONE	J MS-L parent
TOC	50.0	NA		NONE	J MS-L parent
Arsenic	155.0	100.4		Nondetect parent; suggested bias is high.	No qualification
Silver	127.8	91.2		Nondetect parent; suggested bias is high.	No qualification
MMW-17A-D01N-GRW					
Aluminum	165.0	117.1	75-125%	NONE	J MS-H parent
Silver	127.5	89.3		Nondetect parent; suggested bias is high.	No qualification

NA = Not appropriate

Table 1.4
Total vs. Dissolved Qualifications for Inorganics

Sample/Analytes	Absolute difference	IDL (µg/l)	Evaluation Criteria	Action
MMW-48A-T01N/D01N-GRW				
Calcium	200,000 (~51% difference)	18,210	If both sample results are greater than 5xIDL, then the two results should agree within ±30%.	UJ/J TvP-I for samples MMW-48A-T01N-GRW
Iron	14,600 (~58% difference)	3,330		
Magnesium	77,000 (~52% difference)	17,830		
Manganese	3,320 (~50% difference)	70		
Zinc	990 (~49% difference)	100		

Note: The instrument detection limit (IDL), adjusted for dilution, is used as the reporting limit (RL) for total vs. partial evaluations.

Table 1.5
Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	MMW-45A-T01N-GRW	MMW – 45A-T01D-GRW	Criteria Comment	Outside Criteria	RL	Action
TDS (mg/l)	2590	3670	RPD<30%	RPD = 34.5%	10	J FD-I parent samples

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT163C

Sampling Event: August 2003 GRW/SFW

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 10/15/03

Peer Reviewer: Stacey Coker

Date Completed: 02/01/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MMW-44B-T01N-GRW	SA	537878		W	X	X
MMW-44B-D01N-GRW	SA	537879		W	X	
MMW-42B-T01N-GRW	SA	537880		W	X	X
MMW-42B-D01N-GRW	SA	537881		W	X	
RB01T-GRW	RB	537882		W	X	X
RB02T-GRW	RB	537883		W	X	
CC-2A-T01N-GRW	SA	537884		W	X	X
CC-2A-D01N-GRW	SA	537885		W	X	
CC-2B-T01N-GRW	SA	537886		W	X	X
CC-2B-D01N-GRW	SA	537887		W	X	
CC1B-T01N-GRW	SA	537888		W	X	X
CC1B-D01N-GRW	SA	537889		W	X	
CC1A-T01N-GRW	SA	537890		W	X	X
CC1A-T01N-GRW	SA	537891		W	X	X[3]
CC1A-D01N-GRW	SA	537892		W	X	
MW-26-T01N-GRW[4]	SA	537893		W	X	X
MW-26-D01N-GRW[4]	SA	537894		W	X	

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample RB = Rinsate Blank

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.
[3] Limited organics due to the limited sample volume available.
[4] These samples were also collected earlier in August. However, the initial samples were not analyzed because they arrived at the laboratory outside of temperature criteria due to a shipping delay.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The chain of custody (COC) forms for samples MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, MMW-42B-T01N-GRW, and MMW-42B-D01N-GRW were inadvertently not collated into Sample Delivery Group (SDG) accidentally by the laboratory. The laboratory was contacted and then the COCs forms were sent and collated into the package.
Holding Times	No	As noted in the laboratory case narrative, the TOC analyses for the SDG exceeded the 7-day hold time by 3 days due to a malfunction of the TOC analyzer. The 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 25 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony, chromium, copper, iron, mercury, molybdenum, and vanadium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications. An indeterminate bias direction was assigned.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-44B-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample MMW-44B-T01N-GRW, pH class C, and was applicable for 3 out of 24 analytes. The serial dilution results for the August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. In calculating the charge balances, it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit for sample RB01T-GRW as summarized in Table 1.3. Because the calculated TDS (which is biased high because it is based mostly on detection limit for nondetect results) was significantly lower than the measured and reported TDS, the TDS result for RB01T-GRW was qualified as unusable.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB01T-GRW RB02T-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were some detections in the field quality control blanks (RBs) which are summarized in Table 1.4. The RB results for the August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TOC (mg/L)	Conductivity (umhos/cm)	pH
MMW-44B-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	2.0 J	2590 J	6.7 J
MMW-42B-T01N-GRW	0.2 UJ	0.005 UJ	---	3.3 J	2650 J	7.0 J
RB01T-GRW	0.2 UJ	---	---	1.0 UJ	0.43 J	7.2 J
RB02T-GRW	0.2 UJ	0.005 UJ	0.01 UJ	1.3 J	0.41 J	6.3 J
CC-2A-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	1.0 UJ	1320 J	6.2 J
CC-2B-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	1.0 J	1680 J	7.0 J
CC1B-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	2.3 J	610 J	7.4 J
CC1A-T01N-GRW	0.24 J	0.005 UJ	0.01 UJ	NA	515 J	7.2 J
MW-26-T01N-GRW	1.4 J	0.005 UJ	0.16 J	1.5 J	669 J	7.2 J

--- = Samples were within hold time; therefore no qualification was necessary.
NA = This analyte was not applicable in this sample.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples qualified	Qualification Code
Antimony (MS) DF = 2	1.1	1.1	1.1			0.5	MMW-44B-T01N-GRW	U CCB-I
Chromium (P) DF = 1	1.1	1.3	1.8	2.3		1.1	MMW-42B-T01N-GRW, RB02T-GRW, CC-2A-T01N-GRW, CC1B-T01N-GRW, CC1B-D01N-GRW, CC1A-T01N-GRW, CC1A-D01N-GRW, MW-26-T01N-GRW, MW-26-D01N-GRW	U CCB-I
Copper (P) DF = 1	2.8		2.5	3.1	2.6	2.2	MMW-44B-T01N-GRW, MMW-42B-D01N-GRW, RB01T-GRW, RB02T-GRW,	U CCB, MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples qualified	Qualification Code
							CC-2A-T01N-GRW, CC-2A-D01N-GRW, CC-2B-T01N-GRW, CC-2B-D01N-GRW, CC1B-T01N-GRW, CC1B-D01N-GRW, CC1A-T01N-GRW, CC1A-D01N-GRW, MW-26-T01N-GRW, MW-26-D01N-GRW	
Iron (P) DF = 10	17.4		34.7	23.2		16.8	CC1B-T01N-GRW, CC1B-D01N-GRW, MW-26-T01N-GRW, MW-26-D01N-GRW	U CCB-I
Mercury (CV) DF = 1			-0.1			0.1	CC-2A-D01N-GRW, CC-2B-T01N-GRW, CC-2B-D01N-GRW, CC1B-T01N-GRW, CC1B-D01N-GRW, CC1A-T01N-GRW, CC1A-D01N-GRW, MW-26-T01N-GRW, MW-26-D01N-GRW	UJ CCB-L
Molybdenum (P) DF = 1	1.9	1.8	1.9	1.9	2.0	1.1	MMW-44B-T01N-GRW, MMW-42B-D01N-GRW, RB01T-GRW, RB02T-GRW, CC-2B-T01N-GRW, CC-2B-D01N-GRW, CC1B-T01N-GRW, CC1B-D01N-GRW	U CCB, MB-I
Vanadium (MS) DF = 2					-0.21	0.1	MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, RB01T-GRW, RB02T-GRW, CC-2A-T01N-GRW, CC-2A-D01N-GRW, CC-2B-T01N-GRW, CC-2B-D01N-GRW, CC1B-T01N-GRW, CC1B-D01N-GRW, CC1A-D01N-GRW, MW-26-D01N-GRW	UJ/J MB-L

P = ICP MS = ICP-MS CV = Cold Vapor MB = method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total Dissolved Solids Summary

Sample	TDS Measured (mg/L)	TDS Calculated (mg/L)	Ratio of Calculated vs. Measured	Ration Acceptance Range	Qualification Code
RB01T-GRW	92	17	0.18	0.5 to 1.5	R TvP-H

Table 1.4
Positive Results for Rinsate Blanks

Analyte	RB01T-GRW	RB02T-SFW
TDS (mg/L)	R	22
TSS (mg/L)	---	0.8
Chloride (mg/L)	0.47	---
Bicarbonate Alkalinity (mg/L)	2.8	2.5
Total Alkalinity (mg/L)	2.8	2.5
Chromium (µg/l)	27.4	---
Manganese (µg/l)	14.6	---
Nickel (µg/l)	11.3	---

--- = Samples were nondetect, or previously qualified.

R = The TDS result for this rinsate blank sample was rejected based on the comparison of the measured TDS result (92) to the calculated TDS result (17).

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: 98732

Sampling Event: July/August 2003 Reanalysis

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 03/17/04

Peer Reviewer: Stacey Coker

Date Completed: 03/18/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Sulfate	TDS
RB05T-GRW	RB	561551		W	X	X
RB01T-GRW	RB	561552		W	X	

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample FB = Field Blank RB = Rinsate Blank TB = Trip Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Both samples were reanalyzed outside of holding time due to inconsistent results from the original submittals. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	Yes	
Matrix QC • MS/MSD/PDS • LD	NA	There were no matrix quality control samples in this SDG. The matrix quality control results for the July/August 2003 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution SC-7A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB01T-GRW RB05T-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	The rinsate blank results satisfied the applicable concentration-dependent evaluation criteria and data qualification was not necessary. The field quality control results for the July/August 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Sulfate (mg/L)	TDS (mg/L)
RB05T-GRW	5.0 UJ	---
RB01T-GRW	---	5.0 UJ

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE SEPTEMBER 2003 GROUNDWATER AND SURFACE WATER SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

April 2004

URS

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Summary of Reanalysis 2-1

Section 3 Data Review Process 3-1

Section 4 Data Review Commentary 4-1

4.1 Data Review Narratives 4-1
4.2 General Data Quality Issues 4-1
4.2.1 Dilution Schemes/Non-Detects With Elevated RLs 4-1
4.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 4-1
4.2.3 Non-Valid Matrix Spikes 4-2
4.2.4 Laboratory Performance Review (LPR) Findings 4-2

Section 5 Collective Summary of Field QC Results 5-1

5.1 Matrix Spike Results (Accuracy Evaluation) 5-2
5.1.1 Tap Water Matrix Spike 5-2
5.1.2 Groundwater Matrix Spike 5-2
5.1.3 Surface Water Matrix Spike 5-4
5.1.4 Post-Digestion Spikes 5-4
5.2 Laboratory Duplicates (Precision Evaluation) 5-4
5.2.1 Tap Water Laboratory Duplicate 5-5
5.2.2 Groundwater Laboratory Duplicate 5-5
5.2.3 Surface Water Laboratory Duplicate 5-5
5.3 Serial Dilution Results 5-5
5.3.1 Tap Water Serial Dilutions 5-6
5.3.2 Groundwater Serial Dilutions 5-6
5.3.3 Surface Water Serial Dilutions 5-6

Section 6 Collective Summary of Field QC Results 6-1

6.1 Field Duplicate Samples 6-1
6.1.1 Tap Water Field Duplicate Results 6-2
6.1.2 Groundwater Field Duplicate Results 6-2
6.1.3 Surface Water Field Duplicates Results 6-2
6.2 Rinsate Blank Results 6-2
6.2.1 Tap Water Rinsate Blanks 6-3
6.2.2 Groundwater Rinsate Blanks 6-4
6.2.3 Surface Water Rinsate Blanks 6-5
6.3 Field Blank Results 6-6

TABLE OF CONTENTS

Section 7 Overall Data Quality Indicator Assessment 7-1

7.1 Precision 7-1
7.2 Accuracy 7-2
7.3 Completeness 7-2
7.4 Representativeness 7-2
7.5 Comparability 7-3
7.6 Sensitivity 7-3

List of Tables

Table 1.1 Summary of Tap Water Samples Collected During September, 2003 Sampling Event

Table 1.2 Summary of Groundwater Samples Collected During September, 2003 Sampling Event

Table 1.3 Summary of Surface Water Samples Collected During September, 2003 Sampling Event

Table 2.1 TDS Reanalysis for Groundwater Samples Collected During September, 2003 Sampling Event

Table 5.1a Field Samples Submitted for Matrix Spike

Table 5.1b Count of Matrix Spike Samples Collected in September, 2003 Sampling Event

Table 5.1.1 Matrix Spike Outliers and Corresponding Results Qualification for Tap Water Samples

Table 5.1.2 Matrix Spike Outliers and Corresponding Results Qualification for Groundwater Samples

Table 5.1.3 Matrix Spike Outliers and Corresponding Results Qualification for Surface Water Samples

Table 5.2.1 Laboratory Duplicate Outliers and Corresponding Result Qualification for Groundwater Samples

Table 5.3.1 Serial Dilution Outliers and Corresponding Results Qualification for Tap Water Samples

Table 5.3.3 Serial Dilution Outliers and Corresponding Results Qualification for Surface Water Samples

Table 6.1a Water Samples Chosen For Field Duplicate Analyses

Table 6.1b Field Duplicate Collection Frequency for the September, 2003 Sampling Event

Table 6.1.2 Field Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Table 6.2a Rinsate Blanks Collected During the September, 2003 Sampling Event

Table 6.2.b Rinsate Blank Collection Frequency for the September, 2003 Sampling Event

Table 6.2.1 Groundwater Rinsate Blank Outliers and Corresponding Results Qualification for Groundwater Samples

Table 6.2.2 Surface Water Rinsate Outliers and Corresponding Results Qualification for Groundwater Samples

List of Attachments

Attachment 1.1 Data Package WAT169C

Attachment 1.2 Data Package WAT170C

Attachment 1.3 Data Package WAT171A

Attachment 1.4 Data Package WAT172S

Attachment 1.5 Data Package WAT173A

Attachment 1.6 Data Package WAT174C

Attachment 1.7 Data Package WAT175S

Attachment 1.8 Data Package WAT176S

Attachment 1.9 Data Package WAT177A

Attachment 2.0 Data Package TAP01

Attachment 2.1 Data Package TAP02

Attachment 2.2 Data Package TDSRA2

This Data Validation Report (DVR) provides a general overview of the usability of chemical data obtained from the September 2003 sampling activities at Molycorp. In addition, this data validation report is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

This report contains the results of the data validation conducted for tap water, groundwater, and surface water samples collected in September of 2003 at the Molycorp Questa Mine, Questa, New Mexico. These water samples were collected in support of the Remedial Investigation/Feasibility Study (RI/FS). The water samples were sent to Severn Trent Laboratories (STL) Burlington in Colchester, VT. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods used and quality control samples collected were in accordance with the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). The results were reported in seven original data packages.

The tap water, groundwater and surface water samples collected during the September 2003 sampling event and their associated chemical analyses are summarized in Tables 1-1, 1-2, and 1-3, respectively. Included in these tables is the frequency of QC samples collected for each matrix.

Table 1-1
Summary of Tap Water Samples Collected During September, 2003 Sampling Event

Sample Identification (Data Package)[1, 2]	Total Metals	Dissolved Metals	Inorganic	Total Uranium
PONDEROSA-T01N-TAP (TAP01)	X	X	X	X
SWISS MOUNTAIN 5-T01N-TAP (TAP02)	X	X	X	X
FLAG MOUNTAIN 9-T01N-TAP (TAP02)	X	X	X	X
SUMP 5000-T01N-MLW (TAP01)	X	X	X	X
CATER RANCH-T01N-TAP (TAP01)	X	X	X	X
PRIVATE RESIDENCE- 1-T01N-TAP (TAP01)	X, FD	X, FD	X, FD	X, FD
PRIVATE RESIDENCE- 2-T01N-TAP (TAP01)	X, MS/LD	X, MS/LD	X, MS/LD	X, MS/LD
Number TAP samples	7	7	7	7
Number MS/LD	1	1	1	1
Number Field Duplicates	1	1	1	1

FD = Field Duplicate MS/LD = Matrix Spike/Laboratory Duplicate TAP=Tap water

Notes:

1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".
2. Shaded cells denote new locations sampled for the first time in September 2003.

Table 1-2
Summary of Groundwater Samples Collected
During September, 2003 Sampling Event

Sample Identification (Data Package)[1]	Dissolved Metals	Total Metals	Inorganic
MMW-2-T01N-GRW (WAT177A)	X	X	X
MMW-3-T01N-GRW (WAT177A)	X	X	X
MMW-10A-T01N-GRW (WAT173A)	X	X	X
MMW-17A-T01N-GRW (WAT171A)	X	X	X
MMW-17B-T01N-GRW (WAT171A)	X, MS/LD	X, MS/LD	X, MS/LD
MMW-28A-T01N-GRW (WAT174C)	X, FD	X, FD	X, FD
MMW-29A-T01N-GRW (WAT171A)	X	X	X
MMW-31B-T01N-GRW (WAT170C)	X, RB	X, RB	X, RB
MMW-33A-T01N-GRW (WAT171A)	X	X	X
MMW-42B-T01N-GRW (WAT174C)	X	X	X
MMW-44A-T01N-GRW (WAT173A)	X	X	X
MMW-44B-T01N-GRW (WAT174C)	X	X	X
MMW-45A-T01N-GRW (WAT177A)	X	X	X
MMW-45B-T01N-GRW (WAT169C) (9/7/03)	X	X	X
MMW-45B-T01N-GRW (WAT171A) (9/8/03)	X. FD	X, FD	X, FD
MMW-47A-T01N-GRW (WAT173A)	X	X	X
MMW-48A-T01N-GRW (WAT171A)	X	X	X
MMW-49A-T01N-GRW (WAT173A)	X, RB	X, RB	X, RB
GWW-1-T01N-GRW (WAT173A)	X	X	X
GWW-2-T01N-GRW (WAT173A)	X, MS/LD	X, MS/LD	X, MS/LD
GWW-3-T01N-GRW (WAT173A)	X	X	X
SPRING 13 PUMP-T01N-GRW (WAT173A)	X	X	X
SPRING 39 PUMP-T01N-GRW (WAT173A)	X, MS/LD	X, MS/LD	X, MS/LD
LOWER SPRING 13-T01N-GRW (WAT171A)	X	X	X
SPRING 13-T01N-GRW (WAT171A)	X	X	X
MW-1-T01N-GRW (WAT170C)	X, FD	X, FD	X, FD
MW-9A-T01N-GRW (WAT169C)	X	X	X
MW-17-T01N-GRW (WAT169C)	X	X	X
MW-20-T01N-GRW (WAT169C)	X	X	X
MW-21-T01N-GRW (WAT169C)	X	X	X
MW-22-T01N-GRW (WAT170C)	X	X	X
MW-23-T01N-GRW (WAT170C)	X	X	X
MW-24-T01N-GRW (WAT170C)	X	X	X
MW-25-T01N-GRW (WAT169C)	X, RB	X, RB	X, RB
MW-26-T01N-GRW (WAT169C)	X, MS/LD	X, MS/LD	X, MS/LD
MW-27-T01N-GRW (WAT170C)	X	X	X
MW-28-T01N-GRW (WAT169C)	X	X	X
MW-29-T01N-GRW (WAT170C)	X	X	X
CC1A-T01N-GRW (WAT174C)	X	X	X
CC1B-T01N-GRW (WAT174C)	X	X	X
CC2A-T01N-GRW (WAT174C)	X	X	X
CC2B-T01N-GRW (WAT174C)	X	X	X
LOWER REACH GOATHILL-T01N-GRW (WAT169C)	X	X	X

Sample Identification (Data Package)[1]	Dissolved Metals	Total Metals	Inorganic
Number GRW samples	43	43	43
Number MS/LD	4	4	4
Number Field Duplicates	3	3	3
Number Rinsate Blanks	3	3	3

MS/LD = Matrix Spike/Laboratory Duplicate FD = Field Duplicate

RB = Rinsate Blank GRW = Groundwater

Notes:

1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

Table 1-3
Summary of Surface Water Samples Collected
During September, 2003 Sampling Event

Sample Identification (Data Package)[1]	Total Metals	Dissolved Metals	Inorganic
RR-DS-SPRING 13-T01N-SFW (WAT172S)	X, MS/LD	X, MS/LD	X, MS/LD
RR-DS-SPRING 39-T01N-SFW (WAT172S)	X, RB	X, RB	X, RB
RR-US-SPRING 13-T01N-SFW (WAT172S)	X, FD	X, FD	X, FD
RR-US-SPRING 39-T01N-SFW (WAT172S)	X	X	X
LOWER REACH GOATHILL 2-T01N-SFW (WAT175S)	X	X	X
GHGC-T01N-SFW (WAT175S)	X	X	X
STORM 1-T01N-SFW (WAT175S)	X	X	X
SSWC-T01N-SFW (WAT176S)	X	X	X
LOWER REACH CAPULIN CANYON-T01N-SFW (WAT176S)	X	X	X
HAUT N TAUT-T01N-SFW (WAT176S)	X	X	X
HANSEN-T01N-SFW (WAT176S)	X	X	X
Number SFW samples	11	11	11
Number MS/LD	1	1	1
Number Field Duplicates	1	1	1
Number Rinsate Blanks	1	1	1

DS = Downstream US = Upstream MS/LD = Matrix Spike/Laboratory Duplicate

SFW= Surface water FD = Field Duplicate RB = Rinsate Blank

Notes:

1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

The QAPP required that the quality control samples (i.e., MS/LD, FD, RB samples) listed above be collected at a frequency of 5%. As illustrated by the tables above, the required frequency of QC analyses was satisfied for each analysis type.

Two rinsate blanks from the September 2003 groundwater sampling event were reanalyzed for TDS and reported in a separate data package. The decision to reanalyze for TDS was due to the ratio of the measured TDS to the calculated TDS exceeding the acceptance range of 0.5 to 1.5. The results for the reanalyses yielded acceptable TDS ratios and, as such, were retained as the final results. However, the remaining analyses were retained from the original data package. Table 2-1 summarizes the data packages in which the original and reanalysis results are reported.

Table 2-1
Summary of Reanalysis for Groundwater September, 2003 Sampling Event

Sample ID	Data Package	Parameters Retained for Final Data Set
RB01T-GRW	WAT170C	Total Metals, Dissolved Metals, Inorganics (minus TDS)
	TDSRA2	TDS (reanalysis)
RB03T-SFW	WAT172S	Total Metals, Dissolved Metals, Inorganics (minus TDS)
	TDSRA2	TDS (reanalysis)

The result for the reanalysis was reviewed in the same fashion as the original analyses. As a result of this review, the results obtained for reanalyses were selected for reporting and the original results were superseded.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, Inductively Coupled Plasma (ICP) Spectroscopy serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, rinsate blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Section 4.0 includes the data review narratives for each of the data packages. In all cases of professional judgment exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative.

After completing the review sample-specific and laboratory performance parameters in accordance with SOP 12.1, the site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. The reason for this is that site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 5.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Where applicable, the potential direction of bias (high, low, or indeterminate) has been identified and noted on the sample results sheets as H, L, or I, respectively. Section 6.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 7.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

4.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for the data packages included in this event. In order to attain the frequency requirements for laboratory performance reviews, two data packages (WAT169C and WAT175S) were evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 3.0. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

4.2 GENERAL DATA QUALITY ISSUES

During the data review process, several issues were identified which globally affected all relevant water samples analyzed for the September 2003 Tap Water, Groundwater, and Surface Water Sampling Event. Although most of these issues may have been addressed in the individual data review summary reports, it was considered necessary to summarize them in this data validation report.

4.2.1 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

4.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

4.2.3 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

4.2.4 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 3.0. STL data packages WAT169C and WAT175S were used to evaluate the laboratory performance criteria. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated were found to be acceptable and no additional packages for this event were required to be assessed for performance parameters.

The site-specific matrix spike (MS) results, laboratory duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analysis, LD analyses, and the serial dilution results with the samples collected during the September 2003 sampling event.

Additional aliquots of one tap water sample, four groundwater samples, and one surface water sample were submitted for use in matrix QC analyses. Table 5.1 below summarizes the site-samples that were used to prepare MS samples.

Table 5-1
Field Samples Submitted for Matrix Spike

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Wet Chemistry
PR2-T01N-TAP	Tap Water	TAP01	x	x	x
MW-26-T01N-GRW	Groundwater	WAT169C	x	x	x
MMW-17B-T01N-GRW	Groundwater	WAT171A	x	x	x
GWW-2-T01N-GRW	Groundwater	WAT173A	x	x	x
SPRING 39 PUMP-T01N-GRW	Groundwater	WAT173A	x	x	x
RR-DS-SPRING 13-T01N-SFW	Surface Water	WAT172S	x	x	x

[1]For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

Table 5-2 lists the tap water, groundwater, and surface water MS sample sets relative to the number of field samples.

Table 5-2
Count of Matrix Spike Samples Collected in September, 2003 Sampling Event

Analyses	Number of MS samples	Total Samples	Percentage (%)
Tap Water			
Total Metals	1	7	15
Dissolved Metals	1	7	15
Wet Chemistry	1	7	15
Groundwater			
Total Metals	4	43	10
Dissolved Metals	4	43	10
Wet Chemistry	4	43	10
Surface Water			
Total Metals	1	11	13
Dissolved Metals	1	11	13
Wet Chemistry	1	11	13

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

5.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results. A number of spike recoveries were outside of the QC acceptance limits of 75-125% for both inorganics and metals. In general, if less than a quarter of the valid spike recoveries (i.e., the sample concentration was no greater than four times the spike added) for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

5.1.1 Tap Water Matrix Spike

Although the majority of the tap water matrix spike recoveries were within acceptance limits, some exceedances were observed. Table 5-3 summarize the inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added), and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 5-3
Matrix Spike Outliers and Corresponding Results
Qualification for Tap Water Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Total Metals					
Selenium	1	1	0	72.4	UJ/J MS-L all sample results
Dissolved Metals					
Selenium	1	1	0	73.4	UJ/J MS-L all sample results
Inorganics[1]					
Nitrite	1	1	0	0.0	UJ/J MS-L all sample results except R MS-L for parent sample
Sulfate	1	1	0	53.8	UJ/J MS-L all sample results

It was considered necessary to extend qualification to the balance of the September 2003 tap water samples because more than a quarter of the spike results were outside evaluation criteria.

5.1.2 Groundwater Matrix Spike

Although the majority of the groundwater matrix spike recoveries were within acceptance limits, some exceedances were observed. Table 5-4 summarize the inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added), and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 5-4
Metals and Inorganic Matrix Spike Results for Groundwater Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Total Metals					
Aluminum	2	0	0	107.1	
Antimony	4	0	0	108.3	
Arsenic	4	0	**1**	105.2	J MS-H positive parent sample result
Barium	4	0	0	105.3	
Beryllium	4	0	0	107.1	
Boron	4	0	0	111.0	
Cadmium	3	0	**2**	**143.2**	J MS-H all positive cadmium results
Chromium	4	0	0	105.0	
Cobalt	4	0	**1**	115.3	J MS-H positive parent sample result
Copper	4	0	0	114.2	
Iron	1	0	0	106.6	
Lead	4	0	0	110.6	
Manganese	4	0	0	112.1	
Mercury	4	0	0	97.0	
Molybdenum	4	0	0	108.9	
Selenium	4	0	0	95.3	
Nickel	4	0	**1**	118.5	J MS-H positive parent sample result
Thallium	4	0	0	86.6	
Silver	4	0	0	106.8	
Vanadium	4	0	0	104.4	
Zinc	4	0	**1**	122.1	J MS-H positive parent sample result
Cyanide	4	1	0	77.9	UJ/J MS-L parent sample result
Dissolved Metals					
Aluminum	2	0	0	122.2	
Antimony	4	0	0	105.8	
Arsenic	4	0	**1**	108.3	J MS-H positive parent sample result
Barium	4	0	0	103.7	
Beryllium	4	0	0	106.6	
Boron	4	0	0	110.2	
Cadmium	3	0	**2**	**129.3**	J MS-H all positive cadmium results
Chromium	4	0	0	97.0	
Cobalt	4	0	**1**	112.3	J MS-H positive parent sample result
Copper	4	0	**1**	115.0	J MS-H positive parent sample result
Iron	1	0	0	120.5	
Lead	4	0	0	107.6	
Manganese	4	0	0	109.5	
Mercury	4	0	0	97.5	
Molybdenum	4	0	0	107.1	
Selenium	4	0	0	99.9	
Nickel	4	0	**1**	116.2	J MS-H positive parent sample result
Thallium	4	0	0	87.1	
Silver	4	0	0	105.4	
Vanadium	4	0	0	103.0	
Zinc	4	**1**	0	97.0	UJ/J MS-L parent sample result

Table 5-4
Metals and Inorganic Matrix Spike Results for Groundwater Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Inorganics[1]					
Chloride	4	0	0	103.9	
Nitrate	4	0	0	100.9	
Total ALK	1	0	0	105.9	
Fluoride	4	0	0	98.9	
Ammonia	4	0	0	77.3	
TKN	4	0	0	95.0	
Nitrite	4	0	0	100.0	
Ortho-P	4	0	0	94.4	
Phosphorus	4	0	0	99.0	
Sulfate	4	**2**	0	**74.2**	UJ/J MS-L all sample results
TOC	4	0	0	92.4	

[1] MS recoveries for the bicarbonate and total alkalinity analyses are not an appropriate measure of accuracy due to the highly variable pH range (see Section 4.2.2). Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not used to assess the accuracy of the analysis.

For a few of the analytes listed in the table above, it was considered necessary to extend qualification to the balance of the September 2003 groundwater samples because more than a quarter of the spike results were outside evaluation criteria. However, the vast majority (>92%) of matrix spike results were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

5.1.3 Surface Water Matrix Spike

One surface water sample was used for the matrix spike. The surface water matrix spike recoveries were all within acceptance limits. Therefore, no qualifications of data were necessary.

5.1.4 Post-Digestion Spikes

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the matrix spike exceedances were the result of sample matrix, and/or due to a bias in the analytical system. Recoveries for all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

5.2 LABORATORY DUPLICATES (PRECISION EVALUATION)

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion of ≤20% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL. For metals, the Contract Laboratory Program (CLP) Contract Required Detection

Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

Laboratory duplicate analyses were conducted on the same samples used for matrix spike analyses. As such, the frequency of laboratory duplicate analyses also met the QAPP requirement of 8% (i.e., one per 20 field samples).

5.2.1 Tap Water Laboratory Duplicate

All of the tap water laboratory duplicate recoveries were within the laboratory acceptance limits.

5.2.2 Groundwater Laboratory Duplicate

All of the groundwater laboratory duplicate recoveries were within the laboratory acceptance limits.

5.2.3 Surface Water Laboratory Duplicate

Table 5-5 below lists the surface water laboratory duplicate results exceeding criteria and the result qualifiers applied.

Table 5-5
Laboratory Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Analyte (20% or 1xRL)	Sample ID	RPD or Difference	Frequency of Limit Exceedance	Action
Metals All results were within criteria				
Inorganic Chemistry				
TKN	RR-DS-SPRING 13-T01N-SFW	RPD = 76	1 of 1	J D-I for parent sample results.

Only the TKN result for the parent sample RR-DS-SPRING 13-T01N-SFW was qualified as estimated on the basis of laboratory duplicate results.

The laboratory duplicate results indicate overall acceptable precision.

5.3 SERIAL DILUTION RESULTS

ICP serial dilutions are analyzed to help evaluate whether or not interferences exist due to sample matrix. When analyte concentrations are sufficiently high (defined as minimally 50x greater than the instrument detection limit [IDL]), the original results and five fold dilution are expected to agree within 10%. Otherwise interferences resulting in signal suppression or enhancement might be suspected.

The original and diluted sample results are compared by a percent difference (%D). When %Ds of ≤10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate than the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original

sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result.

In general, qualification was limited to the parent sample if fewer than a quarter of the field duplicate results were outside the acceptance range. Conversely, if more than a quarter of the field duplicate results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the magnitude of the exceedances (marginal vs. gross) and the complexity of the sample matrix.

5.3.1 Tap Water Serial Dilutions

Table 5-6 lists the number of applicable tap water serial dilution results for analytes that exceeded criteria. With the exceptions noted in the table, all remaining %Ds between the original sample results and the result obtained from a five-fold diluted sample were ≤10%.

Table 5-6
Serial Dilution Outliers and Corresponding Results Qualification for Tap Water Samples

Analyte	Number of Serial Dilution Samples Analyzed	Number of Valid Results	%Ds >10%	Avg. %Ds	Potential Bias Direction		Action
					Low	High	
Total Arsenic	2	1	1	13.1	1	0	J DL-L, parent (PR2) results only
Dissolved Arsenic	1	1	1	12.7	1	0	
Total Cadmium	2	1	1	11.3	1	0	J DL-L, parent (PR2) results only

PR2-T01N-SFW results for arsenic and cadmium exhibited valid serial dilution results outside QC acceptance limits. PR2-D01N-SFW results for dissolved arsenic also exceeded criteria. Data qualification was issued to only the parent sample because there was only one valid result for the affected analytes. The parent sample results were qualified as estimated with a potential low bias (J DL-L).

5.3.2 Groundwater Serial Dilutions

Seven groundwater samples were used for serial dilution tests. The percent differences (%Ds) between the original sample results and the result obtained from a five-fold diluted sample were all ≤10% for analytes with applicable sample concentrations. Therefore, no qualifications of data were necessary.

5.3.3 Surface Water Serial Dilutions

Table 5-7 the number of applicable groundwater serial dilution results for analytes that exceeded criteria. With the exceptions noted in the table, all remaining %Ds between the original sample results and the result obtained from a five-fold diluted sample were ≤10%.

Table 5-7
Serial Dilution Outliers and Corresponding Results Qualification for Surface Water Samples

Analyte	Number of Serial Dilution Samples Analyzed	Number of Valid Results	%Ds >10%	Avg. %Ds	Potential Bias Direction		Action
					Low	High	
Total Selenium	1	1	1	17.6	1	0	J DL-L, parent results only
Dissolved Selenium	1	1	1	17.1	1	0	

[1] The table is limited to analytes for which the serial dilution results were

Data qualification was issued to the sample RR-DS-SPRING 13-T01N-SFW and RR-DS-SPRING 13-D01N-SFW for total and dissolved selenium, respectively, because there was only one valid detect for the affected analytes. The parent sample results were qualified as estimated with a potential low bias (J DL-L).

The site-specific blanks (field and rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. Field duplicate agreement was assessed to determine the overall precision of the analyses, from both an analytical and sampling perspective, in addition to how representative these analyses were to the samples. The following sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

6.1 FIELD DUPLICATE SAMPLES

Five field duplicate sample pairs were collected during this sampling event. The field duplicate pairs and frequencies are listed in the Table 6-1 and 6-2 below. As there were 7 tap water, 43 groundwater and 11 surface water samples, the frequency of field duplicate collection satisfied the QAPP requirement of 5%.

Table 6-1
Summary of Field Duplicate Water Samples Collected Summer 2003

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Wet Chemistry
PR1-T01N-TAP/PR1-T01D-TAP	Tap Water	TAP01	x	x	x
MW-1-T01N-GRW/ MW-1-T01D-GRW	Groundwater	WAT170C	x	x	x
MMW-45B-T01N-GRW/ MMW-45B-T01D-GRW	Groundwater	WAT171A	x	x	x
MMW-28A-T01N-GRW/MMW-28A-T01D-GRW	Groundwater	WAT174C	x	x	x
RR-US-SPRING 13-T01N-SFW/RR-US-SPRING 13-T01D-SFW	Surface Water	WAT172S	x	x	x

1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

Table 6-2
Field Duplicate Collection Frequency for the September, 2003 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
TAP WATER			
Total Metals	1	7	15
Dissolved Metals	1	7	15
Inorganics	1	7	15
GROUNDWATER			
Total Metals	3	43	7
Dissolved Metals	3	43	7
Inorganics	3	43	7
SURFACE WATER			
Total Metals	1	11	13
Dissolved Metals	1	11	13
Inorganics	1	11	13

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion of ≤25% was applied for cases in which both the sample and sample duplicate concentration were greater than two times the RL as the reporting limit. For field duplicate pairs where the sample or duplicate concentration was less than five times the reporting limits, the absolute difference between the sample and duplicate was compared to the criterion of two times the greater RL. For metals, the Contract Required Detection Limit (CRDL) was used as the RL for the concentration dependent evaluations. With few exceptions, the applicable evaluation criterion was met. The exceptions and the resultant data qualifiers are summarized below.

6.1.1 Tap Water Field Duplicate Results

All field duplicate results were within evaluation criteria for tap water samples, therefore, no qualifications of data were necessary.

6.1.2 Groundwater Field Duplicate Results

The groundwater field duplicate sample results not meeting acceptance criteria and resultant data qualification issued is summarized in Table 6-3 below.

Table 6-3
Field Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Sample ID	Analyte	RPD or Difference	Comment	Action
Inorganic Chemistry				
MMW-28A-T01N-GRW MMW28A-T01D-GRW	Orthophosphate	Difference=0.186 mg/L	1 out of 3	J/UJ FD-I for parent sample
Metals All results were within criteria				

Data qualification for orthophosphate was limited to the parent samples because of the relatively minimal frequency (one pair) and magnitude of the exceedances. The parent sample results were qualified as estimated with an indeterminate bias (J FD-I).

As only two results were qualified based on field duplicate agreement, the vast majority (>99%) of the field duplicate results were within limits.

6.1.3 Surface Water Field Duplicates Results

All field duplicate results were within evaluation criteria for surface water samples, therefore, no qualifications of data were necessary.

6.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blanks are prepared in an identical manner to the samples with which they are associated. Tables 6-4 and 6-5 summarize the rinsate blank samples associated with the samples collected during the September

2003 tap water, groundwater, and surface water sampling event. The QAPP required frequency of 5% for the collection of rinsate blanks was met for the September 2003 sampling event.

Table 6-4
Rinsate Blanks Collected During the September, 2003 Sampling Event

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganic Chemistry
RB01T-GRW	Groundwater	WAT170C	x	x	x
RB02T-GRW	Groundwater	WAT174C	x	x	x
RB03T-SFW	Groundwater	WAT169C	x	x	x
RB01T-SFW	Surface water	WAT172S	x	x	x

[1] The "T" in the field ID was changed to "D" for dissolved metals samples.

Table 6-5
Rinsate Blank Collection Frequency for the September, 2003 Sampling Event

Analyses	Number of RB Samples	Total Samples	Percentage (%)
TAP WATER			
Total Metals	0	7	0
Dissolved Metals	0	7	0
Wet Chemistry	0	7	0
GROUNDWATER			
Total Metals	3	43	7
Dissolved Metals	3	43	7
Wet Chemistry	3	43	7
SURFACE WATER			
Total Metals	1	11	13
Dissolved Metals	1	11	13
Wet Chemistry	1	11	13

The rinsate blank detections results for groundwater and surface water and the resulting data qualification issued are summarized in Tables 6-6 and 6-7, respectively. To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result which might bias the average low or biasing the average high by using the reporting limit.

6.2.1 Tap Water Rinsate Blanks

There were no rinsate blanks samples taken for the tap water September 2003 event because these samples did not require any sampling equipment. Sample containers were filled directly from the tap.

6.2.2 Groundwater Rinsate Blanks

Table 6-6 summarizes the analytes detected in the associated RI/FS groundwater rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 6-6
Groundwater Rinsate Blank Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte	Sample ID	Conc.	Avg. Conc.	RL	Frequency of Detection	Range for Field Samples	Action[1]
Total Metals (µg/l)							
Chromium	RB01T-GRW	1.7	0.933	1.1	1 of 3	1-309	All total chromium <4.67 µg/L were qualified as nondetect (U RB-I).
Copper	RB03T-GRW	2.2	1.467	2.2	1 of 3	0.38-5540	All total zinc results <7.33 µg/L were qualified as nondetect (U RB-I).
Lead	RB01T-GRW	0.75	0.52	0.4	2 of 3	0.04-3020	All total zinc results <2.6 µg/L were qualified as nondetect (U RB-I).
	RB03T-GRW	0.61					
Dissolved Metals (µg/l)							
Aluminum	RB01D-GRW	284	167	217	1 of 3	2.9-337000	All dissolved aluminum results <835 µg/L were qualified as nondetect (U RB-I).
Chromium	RB03D-GRW	4.7	1.933	1.1	1 of 3	1-309	All dissolved chromium results <9.67 µg/L were qualified as nondetect (U RB-I).
Copper	RB03D-GRW	2.5	1.567	2.2	1 of 3	0.38-5540	All dissolved copper results <7.83 µg/L were qualified as nondetect (U RB-I).
Lead	RB01D-GRW	0.61	0.48	0.4	2 of 3	0.04-3020	All dissolved aluminum results <2.40 µg/L were qualified as nondetect (U RB-I).
	RB03D-GRW	0.63					
Manganese	RB01D-GRW	26	14.0	16.0	1 of 3	0.73-84900	All dissolved manganese results <70.0 µg/L were qualified as nondetect (U RB-I).
Nickel	RB03D-GRW	71.2	24.53	2.4	1 of 3	0.84-1890	All dissolved aluminum results <122.67 µg/L were qualified as nondetect (U RB-I).
Zinc	RB01D-GRW	26.4	14.13	19	1 of 3	2-16400	All dissolved zinc results <70.67 µg/L were qualified as nondetect (U RB-I).
Inorganic Chemistry (mg/L)							
Total Alkalinity and Bicarbonate Alkalinity	RB01T-GRW	2.9	2.83	1.0	3 of 3	1.0-545	All total alkalinity and bicarbonate alkalinity results <14.17 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW	2.9					
	RB03T-GRW	2.7					
Ammonia	RB02T-GRW	0.047	0.029	0.1	1 of 3	0.04-0.33	All ammonia results <0.15 mg/L were qualified as nondetect (U RB-I).

Table 6-6
Groundwater Rinsate Blank Outliers and Corresponding Results
Qualification for Groundwater Samples

Analyte	Sample ID	Conc.	Avg. Conc.	RL	Frequency of Detection	Range for Field Samples	Action[1]
Orthophosphate	RB02T-GRW	9.7	3.317	0.25	1 of 3	0.01-26.7	All chloride results <16.58 mg/L were qualified as nondetect (U RB-I).
TDS	RB01T-GRW	90 R	68.0	10.0	1 of 1	48-6530	All TDS results <340 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW	46					
	RB03T-GRW	2920 R					
TKN	RB01T-GRW	0.75	0.400	0.24	2 of 3	0.24-0.67	None of the TKN results were greater than 5x the average rinsate blank concentration.
	RB03T-GRW	0.33					
TOC	RB02T-GRW	1.8	0.933	1.0	1 of 3	0.04-0.61	All ammonia as N results < 0.17 mg/L were qualified as nondetect (U RB-I).

ND = Nondetect MDL = Method Detection Limit RL = Reporting Limit

[1] Criteria for qualification was based on 5x the average concentration found in the rinsate blanks.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

6.2.3 Surface Water Rinsate Blanks

Table 6-7 summarizes the analytes detected in the associated RI/FS surface water rinsate blank samples. Similarly as with the groundwater rinsate blanks, this table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 6-7
Surface Water Rinsate Blank Outliers and Corresponding Results
Qualification for Groundwater Samples

Analyte	Sample ID	Conc.	Ave. Conc.	RL	Frequency of Detection	Range for Field Samples	Action[1]
Inorganic Chemistry (mg/L)							
Bicarbonate Alkalinity and Total Alkalinity	RB01T-SFW	1.5	1.5	1.0	1 of 1	1-545	All total alkalinity and bicarbonate alkalinity results <7.5 mg/L were qualified as nondetect (U RB-I).
Ammonia	RB01T-SFW	0.043	14.13	0.04	1 of 1	0.04-0.33	All ammonia results <0.22 mg/L were qualified as nondetect (U RB-I).
COD	RB01T-SFW	21.7	21.7	20	1 of 1	20-78.3	None of the COD results were greater than 5x the average rinsate blank concentration
Orthophosphate	RB01T-SFW	0.46	0.46	0.01	1 of 1	0.01-26.7	All orthophosphate results <2.3 mg/L were qualified as nondetect (U RB-I).

ND = Nondetect MDL = Method Detection Limit RL = Reporting Limit

[1] Criteria for qualification was based on 5x the average concentration found in the rinsate blanks.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

6.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field Blanks are generated by pouring laboratory-supplied reagent grade water into certified pre-cleaned sample containers, at the sample collection site. In accordance with the project QAPP, field blanks were only required for organic parameters, therefore, no field blanks were required for the September 2003 Sampling Event.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory or rinsate blank contamination. In addition, some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summaries. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

7.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 7-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 7-1
Summary of Precision Assessment for September 2003

Analysis Type	QC Measure	# of Analytes Measured	# Within Criteria	% Results within Criteria
TAP WATER				
Inorganic	FD	18	18	100
	LD	18	18	100
Total metals	FD	25	25	100
	LD	25	25	100
Dissolved Metals	FD	25	25	100
	LD	25	25	100
GROUNDWATER				
Inorganics	FD	54	53	98
	LD	75	75	100
Total metals	FD	75	75	100
	LD	100	100	100
Dissolved Metals	FD	75	75	100
	LD	100	100	100
SURFACE WATER				
Inorganics	FD	20	20	100
	LD	20	20	100
Total Metal	FD	25	25	100
	LD	25	25	100
Dissolved Metals	FD	25	25	100
	LD	25	25	100

In general, the analytical precision and combined sampling and analysis precision are considered to be acceptable as the vast majority of laboratory duplicate and field duplicate results were within acceptance limits.

7.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Percent of MS (and MSD) recoveries meeting criteria are summarized in Table 7-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters.

The table below summarizes the number of valid matrix spike recoveries within acceptance ranges.

Table 7-2
Summary of Accuracy Assessment for September 2003

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
TAP WATER				
Inorganics	MS	14	11	79
Total Metals	MS	21	20	96
Dissolved Metals	MS	21	20	96
GROUNDWATER				
Inorganics	MS	45	42	93
Total Metals	MS	78	72	92
Dissolved Metals	MS	78	71	91
SURFACE WATER				
Inorganics	MS	14	14	100
Total Metals	MS	21	21	100
Dissolved Metals	MS	21	21	100

In general, the level of accuracy obtained on the site-related matrices is considered to be acceptable as the vast majority of matrix spike recoveries were within acceptance ranges.

7.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All samples yielded valid results for all target analytes, consequently the completeness achieved was 100%.

7.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the groundwater and surface water samples collected during the September 2003 sampling event. The close agreement between the field duplicate results, as discussed in Section 6.1, indicated that the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 6.2 indicated that sample processing and subsampling procedures were acceptable.

7.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

7.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. As such, obtaining some nondetect results with elevated reporting limits was not avoidable. While it is anticipated that all data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT169C Sampling Event: September 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Ansley Watson Date Completed: 10/30/03

Peer Reviewer: Stacey Coker Date Completed: 1/15/04 (SS), 2/22/04 (LPR)

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MW-25-T01N-GRW	SA	540395		W	X	X
MW-25-D01N-GRW	SA	540396		W	X	
RB03T-GRW	RB	540397		W	X	X
RB03D-GRW	RB	540398		W	X	
LOWER REACH GOATHILL 2-T01N-GRW	SA	540399	LOREGO2-T01N-GRW	W	X	X
LOWER REACH GOATHILL 2-D01N-GRW	SA	540400	LOREGO2-D01N-GRW	W	X	
MW-26-T01N-GRW	SA	540401		W	X	X
MW-26-D01N-GRW	SA	540402		W	X	
MW-20-T01N-GRW	SA	540403		W	X	X
MW-20-D01N-GRW	SA	540404		W	X	
MW-21-T01N-GRW	SA	540405		W	X	X
MW-21-D01N-GRW	SA	540406		W	X	
MW-17-T01N-GRW	SA	540407		W	X	X
MW-17-D01N-GRW	SA	540408		W	X	
MMW-45A-T01N-GRW	SA	540409		W	X	X
MMW-45A-D01N-GRW	SA	540410		W	X	
MW-9A-T01N-GRW	SA	540411		W	X	X
MW-9A-D01N-GRW	SA	540412		W	X	
MW-28-T01N-GRW	SA	540413		W	X	X
MW-28-D01N-GRW	SA	540414		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the sample receipt log-in sheet, exceeding the 48 hour holding time for nitrate as N, nitrite as N, and orthophosphate was unavoidable for sample MW-26-T01N-GRW because the sample cooler arrived late at the laboratory. For sample MW-26-T01N-GRW, these 48 hour holding times were exceeded by 1 day. For all other samples the 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 24 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, chromium, copper, lead, molybdenum, potassium, TKN, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS MW-26-T01N-GRW MW-26-D01N-GRW • LD MW-26-T01N-GRW MW-26-D01N-GRW	No	Matrix spike (MS) analyses were conducted on samples MW-26-T01N-GRW and MW-26-D01N-GRW. One MS result was outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued. Laboratory duplicates (LD) analyses were conducted on samples MW-26-T01N-GRW and MW-26-D01N-GRW. One LD result was outside acceptance limits. Tables 1.4 summarize these results and the data qualification issued. The matrix quality control results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MW-26-T01N-GRW MW-26-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on sample MW-26-T01N-GRW was applicable for 19 out of 24 analytes, the serial dilution analysis conducted on MW-26-D01N-GRW was applicable for 18 out 24 analytes, both pH class C. The serial dilution results for the September 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recoveries for internal standard Y was low for the ICPMS analysis of samples MMW-45A-T01N-GRW, and MMW-45A-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. For sample RB03T/D-GRW, the dissolved analysis of nickel exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Furthermore, for sample MW-20-T01N/D01N-GRW, the dissolved analysis of copper exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.5 summarizes these results and the data qualification. In calculating the charge balances, it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit for sample RB03T/D-GRW as summarized in Table 1.6. Because the ratio of the calculated TDS (based mostly on detection limit for nondetect results) was significantly lower than the measured and reported TDS, the TDS result was qualified as unusable.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB03T-GRW RB03D-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package included rinsate blanks (RB) samples that outside of the control criteria, as summarized in Table 1.7. The field quality control results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results The laboratory case narrative noted that during the original ICP/MS analysis of the samples in this sample delivery group (SDG), the ICSAB1 standard exhibited a percent recovery for Lead that slightly exceeded control criteria. The samples were reanalyzed. However, the internal standard Bismuth failed for the associated continuing calibration check standards and blanks. The Lead results from both analytical sequences compared well. Therefore, the results from the original analytical sequence were formally presented. As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.
Laboratory Specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (µmhos/cm)	pH
MW-25-T01N-GRW	0.28 J	0.005 UJ	0.019 J	249 J	8.5 J
RB03T-GRW	0.20 UJ	---	0.01 UJ	0.00 J	7.3 J
LOREGO2-T01N-GRW	1.4 J	0.012 J	0.026 J	731 J	7.6 J
MW-26-T01N-GRW	1.1 J	---	0.16 J	644 J	7.2 J
MW-20-T01N-GRW	1.9 J	---	0.023 J	432 J	7.5 J
MW-21-T01N-GRW	8.6 J	---	---	1040 J	7.6 J
MW-17-T01N-GRW	0.32 J	---	---	619 J	7.6 J
MMW-45A-T01N-GRW	0.22 J	---	0.017 J	1640 J	3.8 J
MW-9A-T01N-GRW	0.47 J	---	0.015 J	1220 J	7.1 J
MW-28-T01N-GRW	0.33 J	---	---	1240 J	7.1 J

--- = Samples were analyzed within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=1	30.6	30.4				22.1	LOREGO2-D01N-GRW	U CCB-I
Antimony (MS) DF=2	0.8	0.8	0.7	0.7		0.5	MW-25-T01N-GRW, MW-20-T01N-GRW	U CCB-I
Chromium (P) DF=1		2.3				1.1	MW-25-T01N-GRW, MW-25-D01N-GRW, RB03D-GRW, MW-20-T01N-GRW, MW-20-D01N-GRW	U CCB-I
Copper (P) DF=1		3.1				2.2	MW-25-T01N-GRW, RB03T-GRW, RB03D-GRW, LOREGO2-T01N-GRW, LOREGO2-D01N-GRW, MW-26-D01N-GRW, MW-20-T01N-GRW	U CCB-I
Lead (MS) DF=2					1.017	0.2	All samples in this SDG.	U MB-I
Molybdenum (P) DF=1			-1.4	-1.4	-1.219	1.1	RB03T-GRW, RB03D-GRW	UJ/J MB-L
							MW-20-T01N-GRW, MW-20-D01N-GRW, MW-21-T01N-GRW, MW-21-D01N-GRW, MMW-45A-T01N-GRW, MMW-45A-D01N-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW	UJ/J CCB, MB-L

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Potassium (P) DF=1		394.6	516.9	872.1		318.0	MW-25-T01N-GRW, MW-25-D01N-GRW, MW-26-T01N-GRW, MW-26-D01N-GRW, MW-20-T01N-GRW, MW-20-D01N-GRW, MW-21-T01N-GRW, MW-21-D01N-GRW, MW-17-T01N-GRW, MW-17-D01N-GRW, MMW-45A-T01N-GRW, MMW-45A-D01N-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW, MW-28-T01N-GRW, MW-28-D01N-GRW	U CCB-I
Zinc (P) DF=10					3.041	1.9	MW-20-T01N-GRW, MW-20-D01N-GRW, MW-17-T01N-GRW	U MB-I
TKN DF=1					0.32	0.24	MW-25-T01N-GRW, RB03T-GRW, LOREGO2-T01N-GRW, MW-26-T01N-GRW, MW-20-T01N-GRW, MW-21-T01N-GRW, MW-17-T01N-GRW, MMW-45A-T01N-GRW, MW-9A-T01N-GRW	U MB-I

P=ICP MS=ICP-MS MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit RL= Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
MW-26-T01N-GRW					
Ammonia	74.4	NA	75-125%	NONE	J MS-L parent

NA = Not appropriate

Table 1.4
Laboratory Duplicate Results and Parent Sample Qualifications

Analyte	Sample Result	Duplicate Result	Criteria Comment	Outside Criteria	RL	Action
MW-26-T01N-GRW						
TKN (mg/l)	0.30	0.60	Abs. Diff. <1xRL (0.24)	Abs Diff.=0.3	0.24	J D-I parent

Table 1.5
Total vs. Partial Qualifications for Metals

Sample/Analytes	Absolute Difference	RL	Evaluation Criteria	Action
MW-20-T01N/D01N-GRW				
Copper	15.1	2.2	Evaluation criteria is met when the absolute difference is less than 2x RL (i.e., ≤ 4.4)	J/UJ TVP-I for sample MW-20-T01N/D01N-GRW.
RB03T/D-GRW				
Nickel	68.8	2.4	Evaluation criteria is met when the absolute difference is less than 2x RL (i.e., ≤ 5.0)	J/UJ TVP-I for sample RB03T/D-GRW.

Table 1.6
Total Dissolved Solids Summary

Sample	TDS Measured (mg/L)	TDS Calculated (mg/L)	Ratio of Calculated vs. Measured	Ratio Acceptance Range	Qualification Code
RB03T/D-GRW	2920	23	0.01	0.5 to 1.5	R TvP-H

Table 1.7
Positive Results for Rinsate Blanks

Analyte	RB03T-GRW	RB03D-GRW
Bicarbonate Alkalinity (mg/L)	2.7	NA
Total Alkalinity (mg/L)	2.7	NA
Nickel (µg/l)	---	71.2

NA = Not applicable

--- = Not detected

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT171A Sampling Event: September 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/4/03

Peer Reviewer: Stacey Coker Date Completed: 1/14/04

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MW-22-T01N-GRW	SA	540475		W	X	X
MW-22-D01N-GRW	SA	540476		W	X	
MW-1-T01N-GRW	SA	540477		W	X	X
MW-1-D01N-GRW	SA	540478		W	X	
MW-1-T01D-GRW	FD	540479		W	X	X
MW-1-D01D-GRW	FD	540480		W	X	
MW-24-T01N-GRW	SA	540481		W	X	X
MW-24-D01N-GRW	SA	540482		W	X	
MW-23-T01N-GRW	SA	540483		W	X	X
MW-23-D01N-GRW	SA	540484		W	X	
MW-27-T01N-GRW	SA	540485		W	X	X
MW-27-D01N-GRW	SA	540486		W	X	
MW-29-T01N-GRW	SA	540487		W	X	X
MW-29-D01N-GRW	SA	540488		W	X	
MMW-31B-T01N-GRW	SA	540489		W	X	X
MMW-31B-D01N-GRW	SA	540490		W	X	
RB01T-GRW	RB	540491		W	X	X
RB01D-GRW	RB	540492		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

The TDS result initially reported for sample RB01T-GRW was 90 mg/L. This result was considered to be potentially erroneous because the calculated TDS result is 23 mg/L, and the calculated TDS result can be considered biased high because it is calculated based on detection limits for nondetect results. Reanalysis of this sample 4 days beyond the holding time limit supported the initial result, so the initial result was selected for reporting. However, the TDS result was rejected on the basis of the total vs. partial analysis.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For some samples, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N, and orthophosphate; the analysis for pH and conductivity were exceeded by 2 and 11 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, chromium, copper, iron, lead, manganese, potassium, sodium, TKN, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	There were no matrix QC results included in this package. The matrix quality control results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MW-22-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on samples MW-22-T01N-GRW, pH class C, applicable for 0 out of 24 analytes. The serial dilution results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recoveries for internal standard Y were low for the ICPMS analysis of samples MMW-31B-T01N-GRW and MMW-31B-D01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. For sample MW-23-T01N/D01N-GRW the dissolved analysis of chromium and zinc exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.3 summarizes these results and the data qualification. In calculating the charge balances for sample RB01T/D-GRW, it was noted that the anion/cation balance percent difference was 54.0%, outside the acceptance range of ±13%. Also, the ratio of the calculated TDS to the measured TDS was outside the acceptance limit as summarized in Table 1.4. Because the ratio of the calculated TDS (based mostly on detection limit for nondetect results) was significantly lower than the measured and reported TDS, the TDS result was qualified as unusable.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) MW-1-T01D-GRW MW-1-D01D-GRW • Rinsate Blank (RB) RB01T-GRW RB01D-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package included rinsate blanks (RB) for which some target analytes were detected as summarized in Table 1.5. The field quality control results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	Upon further review of the TDS calculated verses measured , the sample result was found to be higher than probable
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (µmhos/cm)	pH
MW-22-T01N-GRW	---	---	---	205 J	8.2 J
MW-1-T01N-GRW	1.0 J	0.005 UJ	0.01 UJ	927 J	7.4 J
MW-1-T01D-GRW	1.1 J	0.005 UJ	0.01 UJ	924 J	7.4 J
MW-24-T01N-GRW	1.3 J	0.005 UJ	---	322 J	7.6 J
MW-23-T01N-GRW	---	---	---	411 J	8.0 J
MW-27-T01N-GRW	0.22 J	0.005 UJ	0.018 J	1510 J	7.3 J
MW-29-T01N-GRW	---	---	---	347 J	7.7 J
MMW-31B-T01N-GRW	---	---	---	2620 J	6.6 J
RB01T-GRW	---	---	---	0.33 J	6.5 J

--- = Samples were analyzed within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=10	30.0			24.6	21.7	MW-22-T01N-GRW, MW-1-T01N-GRW, MW-1-D01N-GRW, MW-1-T01D-GRW, MW-1-D01D-GRW	U CCB, MB-I
						MW-24-T01N-GRW, MW-23-T01N-GRW, MW-23-D01N-GRW, MW-27-T01N-GRW, MW-29-T01N-GRW, MW-29-D01N-GRW, RB01D-GRW	U MB-I
Chromium (P) DF=1	2.6				1.1	MW-22-T01N-GRW	U CCB-I
Copper (P) DF=1	4.2				2.2	MW-22-T01N-GRW	U CCB-I
Iron (P) DF=10	56.4			47.8	45.5	MW-22-T01N-GRW, MW-1-D01N-GRW, MW-1-D01D-GRW	U CCB, MB-I
						MW-1-T01N-GRW	U CCB-I
						MW-24-T01N-GRW, MW-23-T01N-GRW, MW-23-D01N-GRW, MW-27-T01N-GRW, MW-29-T01N-GRW	U MB-I
Lead (MS) DF=2				0.54	0.2	MW-22-T01N-GRW, MW-22-D01N-GRW, MW-1-T01N-GRW, MW-1-D01N-GRW, MW-1-T01D-GRW, MW-1-D01D-GRW, MW-24-T01N-GRW, MW-24-D01N-GRW, MW-23-T01N-GRW, MW-23-D01N-GRW, MW-27-T01N-GRW, MW-27-D01N-GRW, MW-29-T01N-GRW, MW-29-D01N-GRW, RB01T-GRW, RB01D-GRW	U MB-I
Manganese (P) DF=10	2.4				1.6	MW-22-T01N-GRW, MW-22-D01N-GRW, MW-1-T01N-GRW, MW-1-D01N-GRW, MW-1-T01D-GRW, MW-1-D01D-GRW	UJ/J MB-L

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Potassium (P) DF=1	-476.5	-720.7	-339.7	-640.6	31.8	MW-22-T01N-GRW, MW-1-T01N-GRW, MW-1-D01N-GRW, MW-1-T01D-GRW, MW-1-D01D-GRW, MW-24-T01N-GRW, MW-24-D01N-GRW, MW-27-T01N-GRW, MW-27-D01N-GRW, MW-29-T01N-GRW, MW-29-D01N-GRW, RB01T-GRW, RB01D-GRW	J/UJ CCB, MB-L
						MW-22-D01N-GRW	J CCB-L
Sodium (P) DF=10			1226		990.9	MW-24-T01N-GRW, MW-24-D01N-GRW, MW-23-T01N-GRW, MW-23-D01N-GRW, MW-27-T01N-GRW, MW-27-D01N-GRW, MW-29-T01N-GRW, MW-29-D01N-GRW, MMW-31B-T01N-GRW, MMW-31B-D01N-GRW	U CCB-I
Zinc (P) DF=10				3.631	1.9	MW-22-T01N-GRW, MW-1-D01N-GRW, MW-1-T01D-GRW, MW-1-D01D-GRW, MW-23-T01N-GRW, MW-27-T01N-GRW, MW-29-T01N-GRW, MW-29-D01N-GRW, RB01D-GRW	U MB-I
TKN DF=1				0.25	0.24	MW-22-T01N-GRW, MW-1-T01N-GRW, MW-1-T01D-GRW, MW-24-T01N-GRW, MW-27-T01N-GRW, MW-29-T01N-GRW, MMW-31B-T01N-GRW, RB01T-GRW	U MB-I

P=ICP MS=ICP-MS MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit RL= Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Metals

Sample/Analytes	Absolute Difference	RL	Evaluation Criteria	Action
MW-23-T01N/D01N-GRW				
Chromium	4.9	1.1	Evaluation criteria is met when the absolute difference is less than 2x RL (i.e., ≤ 2.2)	J/UJ TVP-I for samples MW-23-T01N/D01N-GRW.
Zinc	340.3	19.0	Evaluation criteria is met when the absolute difference is less than 2x RL (i.e., ≤ 38.0)	J/UJ TVP-I for samples MW-23-T01N/D01N-GRW.

Table 1.4
Total Dissolved Solids Summary

Sample	TDS Measured (mg/L)	TDS Calculated (mg/L)	Ratio of Calculated vs. Measured	Ratio Acceptance Range	Qualification Code
RB01T/D-GRW	90	23	0.26	0.5 to 1.5	R TvP-H

Table 1.5
Positive Results for Rinsate Blanks

Analyte	RB01T-GRW	RB01D-GRW
Bicarbonate Alkalinity (mg/L)	2.9	NA
Total Alkalinity (mg/L)	2.9	NA
Chromium (µg/l)	1.7	NA
Manganese (µg/l)	---	26.0

NA = Not applicable

--- = Not detected

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT171A Sampling Event: September 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/05/03

Peer Reviewer: Stacey Coker Date Completed: 01/15/04

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MMW-17B-T01N-GRW	SA	540509		W	X	X
MMW-17B-D01N-GRW	SA	540510		W	X	
MMW-48A-T01N-GRW	SA	540511		W	X	X
MMW-48A-D01N-GRW	SA	540512		W	X	
MMW-17A-T01N-GRW	SA	540513		W	X	X
MMW-17A-D01N-GRW	SA	540514		W	X	
MMW-45B-T01N-GRW	SA	540515		W	X	X
MMW-45B-D01N-GRW	SA	540516		W	X	
MMW-45B-T01D-GRW	FD	540517		W	X	X
MMW-45B-D01D-GRW	FD	540518		W	X	
MMW-33A-T01N-GRW	SA	540738		W	X	X
MMW-33A-D01N-GRW	SA	540739		W	X	
MMW-29A-T01N-GRW	SA	540740		W	X	X
MMW-29A-D01N-GRW	SA	540741		W	X	
SPRING 13-T01N-GRW	SA	540742		W	X	X
SPRING 13-D01N-GRW	SA	540743		W	X	
LOWER SPRING 13-T01N-GRW	SA	540744	LOWERSPRNG13-T01N-GRW or LOWERSPRING13-T01N-G	W	X	X
LOWER SPRING 13-D01N-GRW	SA	540745	LOWERSPRNG13-D01N-GRW or LOWERSPRING13-D01N-G	W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For some samples, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N, and orthophosphate; the analysis for pH and conductivity were exceeded by 2 and 11 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Beryllium and molybdenum were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS MMW-17B-T01N-GRW MMW-17B-D01N-GRW • LD MMW-17B-T01N-GRW MMW-17B-D01N-GRW	No	Matrix spike (MS) analyses were conducted on samples MMW-17B-T01N-GRW and MMW-17B-D01N-GRW. Four MS results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued. Laboratory duplicates (LD) analyses were conducted on samples MMW-17B-T01N-GRW and MMW-17B-D01N-GRW. One LD result was outside acceptance limits. Tables 1.4 summarize these results and the data qualification issued. The matrix quality control results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment
Method QC • Surrogates • Serial Dilution MMW-17B-T01N-GRW MMW-17B-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on samples MMW-17B-T01N-GRW and MMW-17B-D01N-GRW, pH class A, both were applicable for 1 out of 24 analytes. The serial dilution results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recoveries for internal standard Y was low for the ICPMS analysis of samples MMW-45B-T01N-GRW, MMW-45B-D01N-GRW, MMW-45B-T01D-GRW, and MMW-45B-D01D-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. For sample MMW-17A-T01N/D01N-GRW and MMW-17B-T01N/D01N-GRW, the anion/cation balance percent difference was 24.55% and 25.65%, respectively, outside the acceptance range of ±13%. However, the contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary based on the ion balance calculation.
Field QC • Field Duplicate (FD) MMW-45B-T01D-GRW MMW-45B-D01N-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	This package included field duplicate (FD) samples that within the control criteria. The field quality control results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (µmhos/cm)	pH
MMW-17B-T01N-GRW	---	---	---	673 J	4.6 J
MMW-48A-T01N-GRW	---	---	---	3210 J	5.5 J
MMW-17A-T01N-GRW	0.20 UJ	---	---	674 J	4.7 J
MMW-45B-T01N-GRW	0.20 UJ	---	---	2360 J	3.9 J
MMW-45B-T01D-GRW	0.20 UJ	---	---	2290 J	3.9 J
MMW-33A-T01N-GRW	2.9 J	0.005 UJ	0.013 J	1540 J	4.6 J
MMW-29A-T01N-GRW	3.1 J	0.005 UJ	0.014 J	1320 J	4.8 J
SPRING 13-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1950 J	3.8 J
LOWERSPRING 13-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1980 J	3.7 J

--- = Samples were analyzed within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB3 (µg/l)	CCB4 (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=10	0.4	0.5	0.3	MMW-48A-T01N-GRW, MMW-48A-D01N-GRW, MMW-17A-T01N-GRW, MMW-17A-D01N-GRW, MMW-33A-T01N-GRW, MMW-33A-D01N-GRW, MMW-29A-T01N-GRW, MMW-29A-D01N-GRW, SPRING 13-T01N-GRW, SPRING 13-D01N-GRW, LOWER SPRING 13–D01N-GRW	U CCB-I
Molybdenum (P) DF=10		1.9	1.2	LOWER SPRING 13-T01N-GRW	U CCB-I

P=ICP CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results And Parent Sample Qualifications

Analyte	MS% R	PDS %R	Criteria	Comment	Action
MMW-17B-T01N-GRW					
Total Alkalinity	52.4	NA	75-125%	Low pH of sample, 4.6, likely cause of reduced recovery.	No qualification
Sulfate	67.0	NA		NONE	J MS-L parent
Arsenic	135.9	102.8		Nondetect, suggested bias is high	No qualification
MMW-17B-D01N-GRW					
Arsenic	132.2	102.4	75-125%	Nondetect	No qualification

NA = Not appropriate

Table 1.4
Laboratory Duplicate Results And Parent Sample Qualifications

Analyte	Sample Result	Duplicate Result	Applicable Criterion	Outside Criteria	RL	Action
MMW-17B-T01N-GRW						
TDS (mg/l)	670	336	RPD is ≤ 20%	RPD=66	10	J D-I parent

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT172S

Sampling Event: September 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 10/28/03

Peer Reviewer: Stacey Coker

Date Completed: 01/14/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD_5	COD
RR-DS-SPRING13-T01N-SFW	SA	540762	RR-DS-SPRG13-T01N-SFW RR-DS-SPRG13-T01N-SF	W	X	X	X	X
RR-DS-SPRING13-D01N-SFW	SA	540763	RR-DS-SPRG13-D01N-SFW RR-DS-SPRG13-D01N-SF	W	X			
RR-US-SPRING39-T01N-SFW	SA	540764	RR-US-SPRG39-T01N-SFW RR-US-SPRG39-T01N-SF	W	X	X	X	X
RR-US-SPRING39-D01N-SFW	SA	540765	RR-US-SPRG39-D01N-SFW RR-US-SPRG39-D01N-SF	W	X			
RR-US-SPRING13-T01N-SFW	SA	540766	RR-US-SPRG13-T01N-SFW RR-US-SPRG13-T01N-SF	W	X	X	X	X
RR-US-SPRING13-D01N-SFW	SA	540767	RR-US-SPRG13-D01N-SFW RR-US-SPRG13-D01N-SFW	W	X			
RR-US-SPRING13-T01D-SFW	FD	540768	RR-US-SPRG13-T01D-SFW RR-US-SPRG13-T01D-SF	W	X	X	X	X
RR-US-SPRING13-D01D-SFW	FD	540769	RR-US-SPRG13-D01D-SFW RR-US-SPRG13-D01D-SF	W	X			
RR-DS-SPRING39-T01N-SFW	SA	540770	RR-DS-SPRG39-T01N-SFW RR-DS-SPRG39-T01N-SF	W	X	X	X	X
RR-DS-SPRING39-D01N-SFW	SA	540771	RR-DS-SPRG39-D01N-SFW RR-DS-SPRG39-D01N-SF	W	X			
RB01T-SFW	RB	540772		W	X	X	X	X
RB01D-SFW	RB	540773		W	X			

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the laboratory case narrative:

The laboratory case narrative noted all cation/anion balances and TDS ratio calculations were within the acceptance range. Upon review of the summary sheet provided by the laboratory, it was noted that rinsate blank sample (RB01T/D-SFW) reported a cation/anion percent difference of –38.36%. This anion/cation balance was calculated and verified independently. The concentrations in this sample were low enough such that the reporting limits controlled the calculations. The balance was therefore not an appropriate measure of accuracy. No qualification of data in this delivery group was considered necessary on the basis of cation/anion imbalances. In addition, this sample reported a TDS ratio of 1.72. Upon review of the raw data sheets, it was noted that the measured TDS amount should have been entered into the balance spreadsheet as 8 mg/L, as opposed to 10 mg/L, as initially reported on the balance sheet. The amended measured TDS value resulted in a recalculated TDS ratio of 1.25, which put the TDS ratio within the specified guidelines. No qualification of data was necessary on the basis of TDS ratio.

The laboratory case narrative noted the TOC and TKN replicates associated with sample RR-DS-SPRING13-T01N-SFW yielded Relative Percent Differences (RPD) that exceed control criteria. Upon review of the reported concentrations for both the sample and the duplicate for these two parameters, it was concluded that only TKN results for this sample would be qualified on the basis of laboratory duplicate results. Due to the fact that neither TKN concentration was in excess of 5x the RL, the difference between the two concentrations was compared to an evaluation criterion of 1x the RL. The TKN result for this sample was qualified as estimated (J), with a qualifier code “D” and indeterminate bias direction assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The laboratory case narrative noted the BOD_5 analyses could not be performed the day the samples were received, but they were analyzed the following day, several hours beyond the 48-hour holding time. Accordingly, all BOD_5 results were qualified as estimated (UJ), as all reported results were nondetect. All nitrate, one nitrite, and two orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). The laboratory case narrative noted the original alkalinity analysis for sample RB01T-SFW was performed within the prescribed analytical holding time of 14 days. However, due to multiple quality control outages, this sample was re-analyzed twice within the holding time. The lab noted a successful acquisition was achieved two days beyond the holding time. As the alkalinity results (hydroxide, carbonate, bicarbonate, and total) were reported from this run, all results were qualified as estimated (J/UJ), as summarized in Table 1.1. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 13 days after sampling and 10 days beyond log-in. The pH for all samples was measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Aluminum and antimony were detected in the metal preparation blank and continuing calibration blanks. All reported aluminum concentrations were sufficiently greater (x5) than the blank detections, thereby removing the need to qualify aluminum results on the basis of blank detections. The CCB and MB detection of antimony resulted in the qualification of antimony results in three samples, as summarized in Table 1.2.
Matrix QC • MS/MSD RR-DS-SPRING13-T01N-SFW-MS/D RR-DS-SPRING13-T01N-SFW-MS • PDS • LD RR-DS-SPRING13-T01N/T01D-SFWD RR-DS-SPRING13-D01N/D01D-SFWD	Yes	The matrix quality control results for the September 2003 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (C) RR-DS-SPRING13-T01N-SFW RR-DS-SPRING13-D01N-SFW Total vs. Partial Analyses Cation/Anion Balance	No	Serial dilution tests were conducted on two samples, RR-DS-SPRING13-T01N-SFW and RR-DS-SPRING13-D01N-SFW. The serial dilution results could not be used to assess potential interferences for two of the 24 metal analytes for the total sample, and three of the 24 metals for the dissolved sample, as the remaining analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. Only selenium reported %Ds in excess of 10%, (17.6% for the total fraction and 17.1% for the dissolved fraction). Accordingly, selenium results in both samples were qualified as estimated (J) with a low bias direction and qualifier code of "DL". The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with exception of sample RB01T/D-SFW, as described in the case narrative summary. No qualification was considered necessary on the basis of cation/anion balance. For sample RR-DS-SPRING 39-T01N/D01N-SFW the analysis of dissolved iron, 1060µg/L, exceeded that of the total analysis, 721 µg/L, beyond variation expected due to the accuracy limitations of the method. Therefore, the results were qualified as estimated UJ/J TvP-I. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5.
Field QC • Field Duplicate RR-DS-SPRING13-T01N-SFWREP RR-DS-SPRING13-D01N-SFWREP • Rinsate Blank RB01T-SFW RB01D-SFW • Field Blank • Trip Blank	No	Field duplicates were assessed for overall sampling precision relative to the analyte and representativeness to the medium. Upon review of the data sheets, and comparison of the results, it became apparent that samples RR-US-SPRING13-T01D-SFW and US-SPRING13-D01D-SFW were suspected of having been reversed. Comparisons of iron, zinc, lead, beryllium, manganese, nickel, copper, and aluminum results between these two duplicate samples provided evidence for this claim. The discrepancies in iron and aluminum results would otherwise have led to the qualification of data unnecessarily. This possibility was confirmed upon communication with the laboratory. The laboratory determined that upon log-in, the sample IDs' for the two bottles in question had been inadvertently reversed. The laboratory is in the process of resubmitting form 1's and EDD's for the affected samples. No qualification of data was necessary as this error had been revealed and the comparisons between the correct duplicate pairs verified a field duplicate agreement. The field QC results for the September 2003 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	Upon review of total vs partial agreement, it was suspected that the sample IDs for RR-US-SPRING13-T01D and D01D were reversed. The laboratory verified that these sample IDs had been inadvertently reversed. This was verified upon inspection of the sample bottles (sample T01D was distinctly clearer than D01D). This did not adversely affect the quality or usability of the data, as this error had been suspected, verified, and corrected. The laboratory accordingly resubmitted corrected revised Form 1's, both in hard copy and electronically.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate – N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	BOD_5 (mg/L)	Cond. (µmhos/ cm)	pH (std units)	OH^- ALK (mg/L)	CO_3^{-2} ALK (mg/L)	HCO_3^- ALK (mg/L)	Total ALK (mg/L)
RR-DS-SPRING13-T01N-SFW	0.29 J	0.0050 UJ	0.010 UJ	1.3 UJ	301 J	6.5 J	---	---	---	---
RR-US-SPRING39-T01N-SFW	0.31 J	---	---	1.3 UJ	263 J	7.4 J	---	---	---	---
RR-US-SPRING13-T01N-SFW	0.33 J	---	0.010 UJ	1.3 UJ	299 J	7.8 J	---	---	---	---
RR-US-SPRING13-T01D-SFW	0.30 J	---	0.010 UJ	1.3 UJ	302 J	7.8 J	---	---	---	---
RR-DS-SPRING39-T01N-SFW	0.36 J	---	---	1.3 UJ	289 J	7.6 J	---	---	---	---
RB01T-SFW	0.20 UJ	---	---	1.3 UJ	0.00 J	6.7 J	1.0 UJ	1.0 UJ	1.5 J	1.5 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS)	1.2	1.2	1.1	1.1	0.622	0.50	RR-DS-SPRING13-D01N-SFW RR-DS-SPRING13-T01N-SFW RR-US-SPRING39-T01N-SFW	U MB,CCB-I

MS=ICP-MS CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT173A Sampling Event: September 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/06/03

Peer Reviewer: Stacey Coker Date Completed: 01/15/04

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
GWW-2-T01N-GRW	SA	540782		W	X	X
GWW-2-D01N-GRW	SA	540783		W	X	
GWW-3-T01N-GRW	SA	540784		W	X	X
GWW-3-D01N-GRW	SA	540785		W	X	
GWW-1-T01N-GRW	SA	540786		W	X	X
GWW-1-D01N-GRW	SA	540787		W	X	
SPRING 39 PUMP-T01N-GRW	SA	540788	SPRG39PMP-T01N-GRW	W	X	X
SPRING 39 PUMP-D01N-GRW	SA	540789	SPRG39PMP-D01N-GRW	W	X	
MMW-10A-T01N-GRW	SA	540790		W	X	X
MMW-10A-D01N-GRW	SA	540791		W	X	
MMW-44A-T01N-GRW	SA	540792		W	X	X
MMW-44A-D01N-GRW	SA	540793		W	X	
MMW-49A-T01N-GRW	SA	540794		W	X	X
MMW-49A-D01N-GRW	SA	540795		W	X	
SPRING 13 PUMP-T01N-GRW	SA	540796	SPRG13PMP-T01N-GRW	W	X	X
SPRING 13 PUMP-D01N-GRW	SA	540797	SPRG13PMP-D01N-GRW	W	X	
MMW-47A-T01N-GRW	SA	541006		W	X	X
MMW-47A-D01N-GRW	SA	541007		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

2 Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

The laboratory case narrative noted that the original Total Dissolved Solids (TDS) analysis of sample MMW-44A-T01N-GRW, which was performed within holding time, yielded a net weight after drying that greatly exceeded the upper limit of the method. This sample was re-analyzed using a smaller sample volume outside of holding time yielding results comparable to the original analysis. The result from the re-analysis has been formally presented in this case submittal, with the data from the original analysis being presented in the raw data section of the data package. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.

The laboratory case narrative noted that during the orthophosphate analysis performed 9/11/03, the associated initial calibration blank for the second sample batch from the day yielded a concentration that exceeded the reporting limit. Sample MMW-49A-T01N-GRW also exhibited a concentration above the reporting limit, resulting in the need for a reanalysis. This sample was re-analyzed 8 days beyond the holding time yielding comparable results. The result from the re-analysis has been formally presented. The data from the original analysis is provided in the raw data section of the data package. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	
Holding Times	No	For some samples, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N, and orthophosphate; the analysis for pH and conductivity were exceeded by 2 and 11 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Beryllium, molybdenum, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS GWW-2-T01N-GRW GWW-2-D01N-GRW SPRING 39 PUMP-T01N-GRW SPRING 39-PUMP-D01N-GRW • LD GWW-2-T01N-GRW GWW-2-D01N-GRW SPRING 39 PUMP-T01N-GRW SPRING 39-PUMP-D01N-GRW	No	Matrix spike (MS) analyses were conducted on samples GWW-2-T01N-GRW, GWW-2-D01N-GRW, SPRING 39 PUMP-T01N-GRW, and SPRING 39 PUMP-D01N-GRW. Fifteen MS results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued. Laboratory duplicates (LD) analyses were conducted on samples GWW-2-T01N-GRW, GWW-2-D01N-GRW, SPRING 39-T01N-GRW, and SPRING 39 PUMP D01N-GRW. Four LD results were outside acceptance limits. Tables 1.4 summarize these results and the data qualification issued. The matrix quality control results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution GWW-2-T01N-GRW GWW-2-D01N-GRW SPRING 39 PUMP-T01N-GRW SPRING 39 PUMP-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on samples GWW-2-T01N-GRW, GWW-2-D01N-GRW, SPRING 39 PUMP-T01N-GRW, and SPRING 39 PUMP-D01N-GRW, pH class A. Serial dilution results for samples GWW-2-T01N-GRW and GWW-2-D01N-GRW were applicable for assessing potential interferences for 2 out of 24 analytes, while sample SPRING 39 PUMP-T01N-GRW and SPRING 39 PUMP-D01N-GRW were applicable for 1 out of 24 analytes. The serial dilution results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recoveries for internal standard Y was low for the ICPMS analysis of samples GWW-2-T01N-GRW, GWW-2-D01N-GRW, GWW-3-T01N-GRW, GWW-3-D01N-GRW, MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, MMW-44A-T01D-GRW, and MMW-44A-D01D-GRW. Therefore, molybdenum and beryllium results for all samples were reported from the trace ICP. The trace ICP molybdenum and beryllium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample GWW-1-T01N-GRW the analysis of orthophosphate exceeded that of the total analysis of phosphorus beyond variation expected due to the accuracy limitations of the method. Table 1.5 summarizes these results and the data qualification. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. The reported cation/anion balances did not meet this criterion in samples SPRING 39 PUMP-T01N/D01N-GRW (14.18%), SPRING 13 PUMP-T01N/D01N-GRW (14.06%), and MMW-47A-T01N/D01N-GRW (24.59%), which agrees with the recalculated cation/anion balance. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to analysis as a class "A" groundwater sample. Therefore no qualification of these sample results was considered necessary.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Conductivity (µmhos/cm)	pH
GWW-2-T01N-GRW	3.2 J	0.005 UJ	0.023 J	---	1710 J	4.4 J
GWW-3-T01N-GRW	3.0 J	0.005 UJ	0.029 J	---	1670 J	4.3 J
GWW-1-T01N-GRW	3.5 J	0.005 UJ	1.3 J	---	1400 J	4.6 J
SPRING 39 PUMP-T01N-GRW	1.8 J	0.005 UJ	0.01 UJ	---	1590 J	4.7 J
MMW-10A-T01N-GRW	4.7 J	0.005 UJ	0.033 J	---	2050 J	4.2 J
MMW-44A-T01N-GRW	---	---	---	4580 J	3130 J	3.4 J
MMW-49A-T01N-GRW	2.7 J	---	0.028 J	---	1580 J	4.2 J
SPRING 13 PUMP-T01N-GRW	0.20 UJ	0.013 J	0.01 UJ	---	1570 J	3.7 J
MMW-47A-T01N-GRW	1.0 J	0.005 UJ	0.01 UJ	---	770 J	5.6 J

--- = Samples were analyzed within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=10			0.5			0.3	SPRING 39 PUMP-D01N-GRW, MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, MMW-49A-T01N-GRW, MMW-49A-D01N-GRW, SPRING 13 PUMP-T01N-GRW, SPRING 13 PUMP-D01N-GRW, MMW-47A-T01N-GRW, MMW-47A-D01N-GRW	U CCB-I
Molybdenum (P) DF=10		1.9		1.4		1.2	MMW-47A-T01N-GRW, MMW-47A-D01N-GRW	U CCB-I
Zinc (P) DF=100					3.2	1.9	SPRING 39 PUMP-T01N-GRW, MMW-47A-T01N-GRW, MMW-47A-D01N-GRW	U MB-I

P=ICP MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit DF=Dilution Factor

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results And Parent Sample Qualifications

Analyte	MS %R	PDS %R	Criteria	Comment	Action
GWW-2-T01N-GRW					
Total Alkalinity	13.5	NA	75-125%	It was not considered necessary to qualify the nondetect result for the parent sample due to the acidic nature of the sample which served to consume the bicarbonate spike (pH=4.4).	No qualification
Cadmium	188.1	106.9		Parent sample is nondetect; suggested bias is high.	No qualification
Cobalt	132.6	104.6		Parent sample is nondetect; suggested bias is high.	No qualification
Cyanide	37.9	106.4		NONE	UJ MS-L parent
GWW-2-D01N-GRW					
Cadmium	145.7	107.7	75-125%	Parent sample is nondetect; suggested bias is high.	No qualification
Cobalt	128.9	105.2		Parent sample is nondetect; suggested bias is high.	No qualification
SPRING 39 PUMP-T01N-GRW					
Total Alkalinity	19.3	NA	75-125%	It was not considered necessary to reject the nondetect result for the parent sample due to the acidic nature of the sample (pH=4.7).	J MS-L parent
Sulfate	68.2	NA		NONE	J MS-L parent
Cadmium	132.3	107.1		Parent sample is nondetect; suggested bias is high.	No qualification
Nickel	133.2	106.5		Parent sample is nondetect; suggested bias is high.	No qualification
Zinc	140.4	107.6		NONE	J MS-H
SPRING 39 PUMP-D01N-GRW					
Cadmium	136.7	107.7	75-125%	Parent sample is nondetect; suggested bias is high.	No qualification
Copper	130.8	108.4		Parent sample is nondetect; suggested bias is high.	No qualification
Nickel	140.7	107.5		Parent sample is nondetect; suggested bias is high.	No qualification
Zinc	69.9	106.5		NONE	J MS-L

NA = Not appropriate

Table 1.4
Laboratory Duplicate Results And Parent Sample Qualifications

Analyte	Sample Result	Duplicate Result	Criteria Comment	Outside Criteria	RL	Action
SPRING 39 PUMP-T01N-GRW						
Bicarbonate Alkalinity (mg/l)	2.7	4.5	Abs. diff. between the sample results and the duplicate results is less than 1x the RL (1.0)	Abs. diff.=1.8	1.0	J D-I parent
Total Alkalinity (mg/l)	2.7	4.5	Abs. diff. between the sample results and the duplicate results is less than 1x the RL (1.0)	Abs. diff.=1.8	1.0	J D-I parent
Ammonia (mg/l)	0.056	0.11	Abs. diff. between the sample results and the duplicate results is less than 1x the RL (0.04)	Abs. diff.= 0.054	0.04	J D-I parent
TOC (mg/l)	1.0	2.3	Abs. diff. between the sample results and the duplicate results is less than 1x the RL (1.0)	Abs. diff.=1.3	1.0	UJ D-I parent

Table 1.5
Total vs. Partial Qualifications

Sample/Analytes	Absolute Difference	RL	Evaluation Criteria	Action
GWW-1-T01N-GRW				
Orthophosphate vs. Phosphorus	0.107	0.01	Evaluation criteria is met when the absolute difference is less than 2x RL (i.e., ≤ 0.02 mg/L)	J/UJ TVP-I for sample GWW-1-T01N-GRW.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT174C Sampling Event: September 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/06/03

Peer Reviewer: Stacey Coker Date Completed: 01/15/04

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MMW-42B-T01N-GRW	SA	540846		W	X	X
MMW-42B-D01N-GRW	SA	540847		W	X	
RB02T-GRW	RB	540848		W	X	X
RB02D-GRW	RB	540849		W	X	
MMW-28A-T01N-GRW	SA	540850		W	X	X
MMW-28A-D01N-GRW	SA	540851		W	X	
MMW-28A-T01D-GRW	FD	540852		W	X	X
MMW-28A-D01D-GRW	FD	540853		W	X	
MMW-44B-T01N-GRW	SA	540854		W	X	X
MMW-44B-D01N-GRW	SA	540855		W	X	
CC1A-T01N-GRW	SA	541234		W	X	X[3]
CC1A-D01N-GRW	SA	541235		W	X	
CC2A-T01N-GRW	SA	541236		W	X	X
CC2A-D01N-GRW	SA	541237		W	X	
CC1B-T01N-GRW	SA	541238		W	X	X
CC1B-D01N-GRW	SA	541239		W	X	
CC2B-T01N-GRW	SA	541240		W	X	X
CC2B-D01N-GRW	SA	541241		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

[3] Limited inorganic suite due to limited sample volume available.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory noted a lack of adequate preservative in sample MMW-42B-T01N-GRW resulting in a possible loss of cyanide, therefore the cyanide result for this sample is estimated "UJ" for nondetects. The laboratory did add additional NaOH and ascorbic acid to these samples to adjust the pH.
Holding Times	No	For some samples, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N, and orthophosphate; the analysis for pH and conductivity were exceeded by 2 and 11 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony, chromium, cobalt, mercury, molybdenum, and potassium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	There were no matrix QC results included in this package. The matrix quality control results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution CC1A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on sample CC1A-T01N-GRW, pH class C, was applicable for 0 out of 24 analytes. The serial dilution results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recoveries for internal standard Y was low for the ICPMS analysis of sample CC2A-T01N-GRW. Data qualification was not necessary as none of the ICPMS analytes reported were quantitated using this standard. For samples RB02T-GRW, MMW-44B-T01N-GRW, MMW-28A-T01N-GRW the analysis of orthophosphate exceeded that of the total analysis of phosphorus beyond variation expected due to the accuracy limitations of the method. Also for sample MMW-42B-T01N-/D01N-GRW the dissolved analysis of zinc exceeded that of the total analysis beyond variations expected due to the accuracy limitations of the method. Table 1.3 summarizes these results and the data qualification. For sample RB02T-GRW, the anion/cation balance percent difference was 14.52, outside the acceptance range of ±13%. However, the contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore no qualification of these sample results was considered necessary based on the ion balance calculation.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) MMW-45B-T01D-GRW MMW-45B-D01N-GRW • Rinsate Blank (RB) RB02T-GRW RB02D-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package included field duplicate (FD) samples that were outside of the control criteria. Table 1.4 summarizes these results and data qualification. This package included rinsate blank (RB) for which target analytes were detected. Table 1.5 summarizes these results and data qualification. The field quality control results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (µmhos/cm)	pH
MMW-42B-T01N-GRW	0.02 UJ	---	---	2750 J	6.9 J
RB02T-GRW	0.20 UJ	---	9.7 J	0.00 J	7.1 J
MMW-28A-T01N-GRW	0.47 J	0.005 UJ	0.01 UJ	799 J	6.1 J
MMW-28A-T01D-GRW	0.49 J	0.005 UJ	4.9 J	803 J	6.1 J
MMW-44B-T01N-GRW	0.2 UJ	0.005 UJ	5.0 J	2680 J	6.7 J
CC1A-T01N-GRW	---	---	---	446 J	7.4 J
CC2A-T01N-GRW	0.24 J	0.005 UJ	0.01 UJ	975 J	6.4 J
CC1B-T01N-GRW	---	---	---	579 J	7.4 J
CC2B-T01N-GRW	---	---	---	1610 J	7.1 J

--- = Samples were analyzed within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS) DF=2	0.9	0.8				0.5	MMW-44B-T01N-GRW	U CCB-I
Chromium (P) DF=1	1.3		4.6			1.1	MMW-44B-T01N-GRW, CC1A-T01N-GRW, CC1A-D01N-GRW, CC2A-T01N-GRW, CC2A-D01N-GRW, CC2B-T01N-GRW	U CCB-I
Cobalt (P) DF=1			4.8			2.9	MMW-44B-T01N-GRW, MMW-44B-D01N-GRW	U CCB-I
Mercury (CV) DF=1				-0.1		0.1	All the samples in this SDG.	UJ/J CCB-L
Molybdenum (P) DF=1	-2.6		-2.6			1.1	MMW-42B-T01N-GRW, MMW-42B-D01N-GRW, RB02T-GRW, RB02D-GRW, MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-28A-T01D-GRW, MMW-28A-D01D-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, CC2A-T01N-GRW, CC2A-D01N-GRW, CC1B-T01N-GRW, CC1B-D01N-GRW, CC2B-T01N-GRW, CC2B-D01N-GRW	UJ/J CCB-L
Potassium (P) DF=1	978.6					318	MMW-42B-T01N-GRW, MMW-42B-D01N-GRW, MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-28A-T01D-GRW, MMW-28A-D01D-GRW, CC1A-T01N-GRW, CC1A-D01N-GRW, CC1B-T01N-GRW, CC1B-D01N-GRW	U CCB-I
TKN DF=1					0.25	0.24	MMW-28A-T01N-GRW, CC2A-T01N-GRW, CC1B-T01N-GRW, CC2B-T01N-GRW	U MB-I

P=ICP CV=Cold Vapor MS=ICP-MS MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit

RL= Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Metals

Sample/Analytes	Absolute Difference	RL	Evaluation Criteria	Action
RB02T-GRW				
Orthophosphate vs. Phosphorus	0.378	0.01	Evaluation criteria is met when the absolute difference is less than 2x RL (0.02)	J/UJ TVP-I for samples RB02T-GRW.
MMW-28A-T01D-GRW				
Orthophosphate vs. Phosphorus	0.0186	0.01	Evaluation criteria is met when the absolute difference is less than 2x RL (0.02)	J/UJ TVP-I for samples MMW-28A-T01D-GRW.
MMW-44B-T01N-GRW				
Orthophosphate vs. Phosphorus	0.15	0.01	Evaluation criteria is met when the absolute difference is less than 2x RL (0.02)	J/UJ TVP-I for samples MMW-44A-T01N-GRW.
MMW-42B-T01N/D01N-GRW				
Zinc	120.0	19.0	Evaluation criteria is met when the absolute difference is less than 2x RL (38.0)	J/UJ TVP-I for samples MMW-42B-T01N-GRW.

Table 1.4
Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	MMW-28A-T01N-GRW	MMW-28A-T01D-GRW	Criteria Comment	Outside Criteria	RL	Action
Orthophosphate (mg/l)	0.01	0.196	Abs. Diff. <2xRL (0.02)	Abs. Diff=0.186	0.01	J FD-H parent

Table 1.5
Positive Results for Rinsate Blanks

Analyte	RB02T-GRW
TDS (mg/L)	46.0
Bicarbonate Alkalinity (mg/L)	2.9
Total Alkalinity (mg/L)	2.9
Ammonia (mg/L)	0.047
TOC (mg/L)	1.8

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT175S

Sampling Event: September 2003 SFW Storm Event #5

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter

Date Completed: 11/18/03

Peer Reviewer: Stacey Coker

Date Completed: 11/18/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD	COD
LOWERREACHGOATHILL2-T01N-SFW	SA	541069	LOWREGOAT2-T01N-SFW	W	X	X		
LOWERREACHHOATHILL2-D01N-SFW	SA	541070	LOWREGOAT2-D01N-SFW	W	X			
GHGC-T01N-SFW	SA	541071		W	X	X		
GHGC-D01N-SFW	SA	541072		W	X			
STORM1-T01N-SFW	SA	541073		W	X	X	X	X
STORM1-D01N-SFW	SA	541074		W	X			
ISCO-RR-6-T01N-SFW	SA	541075		W	X[3]	X		
ISCO-RR-6-D01N-SFW	SA	541076		W	X			
ISCO-RR-6-T02N-SFW	SA	541077		W	X	X		
ISCO-RR-6-D02N-SFW	SA	541078		W	X[3]			
ISCO-RR-6-T03N-SFW	SA	541079		W	X	X		
ISCO-RR-6-D03N-SFW	SA	541080		W	X			
ISCO-RR-6-T04N-SFW	SA	541081		W	X	X[3]		
ISCO-RR-6-D04N-SFW	SA	541082		W	X			

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to the limitations on the laboratory software, the field IS were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

[3]Additional volume submitted for matrix QC

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues noted in the laboratory case narrative are summarized in the appropriate sections in the table to follow.

The case narrative listing of the samples reported in the package had one error. Sample ISCO-RR-6-D04N-SFW was listed as having been used for matrix QC analyses. However, the matrix QC analyses were not conducted on this sample. No additional volume was sent for matrix QC analyses as this sample was not scheduled for extra volume collection.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The chain of custody (COC) did not list the pH classes for samples ISCO-RR-6-T/D01N-SFW, ISCO-RR-6-T/D02N-SFW, ISCO-RR-6-T/D03N-SFW, and ISCO-RR-6-T/D04N-SFW. These samples were analyzed without any dilution.
Holding Times	No	The prescribed analytical holding time of 48 hours for nitrate as N, nitrite as N, orthophosphate, and BOD_5 was not met for three samples. The time exceedances were less than two times the holding time, thereby resulting in the qualification of these results as estimated (J/UJ). The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken nine days after sampling and seven days beyond log-in. The pH for all samples was measured approximately five and a half hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD ISCO-RR-6-T01N-SFWMS ISCO-RR-6-D02N-SFWMS ISCO-RR-6-T04N-SFWMS • PDS ISCO-RR-6-T01N-SFWA ISCO-RR-6-D02N-SFWA • LD ISCO-RR-6-T01N-SFWREP ISCO-RR-6-D02N-SFWREP ISCO-RR-6-T04N-SFWREP	No	The samples listed to the left were used for matrix QC analyses as specified by the ISCO Bottle Filling Logistics tables contained in the Automated Samplers on the Red River Field Sampling Plan, with one modification. The extra W-6 bottle planned at the third sampling interval did not fill. As such the extra bottle filled at the forth sampling interval was submitted for matrix QC analyses for the inorganic parameters analyzed from the W-6 bottle rather than the W-8 bottle. The reason for this substitution is that a greater number of analyses were performed on the W-6 bottle (6 analytes) vs the W-8 bottle (1 analyte). As a result, there was not enough extra sample volume to do a laboratory duplicate analysis for TSS, but matrix QC analyses were conducted for the other six inorganic analytes. The matrix spike analysis of sample ISCO-RR-6-T04N-SFW recovered sulfate below the acceptance range of 75-125%, suggesting a potential low bias in the reporting of sulfate results in samples. The matrix spike analysis of sample ISCO-RR-6-T01N-SFW recovered arsenic, lead, and selenium below the acceptance range of 75-125%, suggesting a potential low bias in the reporting of these analytes in samples. Table 1.3 summarizes these analytes along with the associated percent recoveries and the qualification codes assigned to the parent samples. Post digestion spikes were performed on all metal analytes. The post digestion spike recoveries for those analytes that did not meet the specified

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		criterion for the initial matrix spike recoveries were reviewed. Selenium was recovered below the acceptance range in sample ISCO-RR-6-T01N-SFW, suggesting a potential low bias in the reporting of selenium. At this time, selenium in this sample was qualified as estimated (J), with a low bias, as listed in Table 1.3. The result for fluoride in sample ISCO-RR-T04N-SFW was qualified as estimated (J) on the basis of laboratory duplicate disagreement. Fluoride was measured in the original sample at 0.40 mg/L, and in the duplicate at 0.18 mg/L. As both concentrations were less than 5x the RL (0.10 mg/L), the absolute difference was compared to 1x the RL, thereby resulting in qualification. The matrix quality control results for the September 2003 surface water and Storm Event #5 sampling events will be evaluated collectively and any resultant data qualification will be summarized in the individual overall assessments for each event.
Method QC • Surrogates • Serial Dilution (A) ISCO-RR-6-T01N-SFW ISCO-RR-6-D02N-SFW • Total vs. Partial Analyses • Cation/Anion Balance	No	The internal standard recovery of ^{89}Y was slightly above the criterion of 30-120% for the ICPMS analysis of sample ISCO-RR-6-T03N-SFW. As mentioned in the laboratory case narrative, this sample was analyzed on the trace ICP, resulting in molybdenum results comparable to those attained from the ICPMS. Consequently, the ICPMS result was reported because it was confirmed by the ICP. As a conservative measure, the molybdenum result for this sample was qualified as estimated. Two serial dilution tests were conducted on matrix spike samples ISCO-RR-T01N-SFW and ISCO-RR-6-D02N-SFW. The serial dilution results could not be used to assess potential interferences for 4 of the 24 metals analyzed by ICP since 20 analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution for both samples. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. Table 1.4 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The orthophosphate concentration of 0.49 mg/L in sample GHGC-T01N-SFW was greater than the total phosphorus concentration of 0.10 mg/L. Due to the fact that both partial and total concentrations for both samples did not exceed 5x the RL, the absolute difference between the partial and total results were compared to an evaluation criterion of ±2x RL. The orthophosphate and phosphorus results for sample GHGC-T01N-SFW were accordingly qualified as estimated (J) with an indeterminate direction of bias. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ± 13% to assess the usability of the data. All reported cation/anion balances met this criterion and consequently did not require data qualification. As noted in the laboratory case narrative, the cation/anion balance for the Storm water samples (STORM1-T01N-SFW and STORM1-DO1N-SFW) was not calculated due to the fact that a limited list of inorganic analytes were analyzed, and the calculated balance would not have been a representative assessment of the data quality. The ratios of calculated versus measured TDS for all field samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	Yes	No field QC samples were analyzed with this data package. The field QC results for the September 2003 surface water and Storm Event #5 sampling events will be evaluated collectively and any resultant data qualification will be summarized in the individual overall assessments for each event.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	The high standard of nitrate dropped on some ICALs, however all samples were within the range of the calibration curve.
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	Information regarding the mass resolution is not available due to software limitations. However, acceptable mass resolution can be inferred from the other QC sample results, which satisfied evaluation criteria.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Cond. (µmhos/cm)	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Orthophosphate (mg/L)	BOD_5 (mg/L)	pH (std. Units)
LOWREGOAT2-T01N-SFW	499 J	0.64 J	0.0050 UJ	0.017 J	1.3 UJ	7.2 J
GHGC-T01N-SFW	436 J	0.45 J	0.0050 UJ	0.49 J	1.3 UJ	7.4 J
STORM1-T01N-SFW	225 J	0.67 J	0.0050 UJ	0.022 J	1.3 UJ	8.0 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P)	--	---	32.9	---	65.4	30.7	GHGC-D01N-SFW ISCO-RR-6-D01N-SFW LOWREGOAT2-D01N-SFW STORM1-D01N-SFW	U MB-I U MB,CCB-I
Antimony (MS)	0.7	0.7	0.6	---	---	0.5	LOWREGOAT2-T01N-SFW	U CCB-I
Beryllium (P)	0.3	0.5	0.3	0.6	---	0.3	GHGC-T01N-SFW ISCO-RR-6-D01N-SFW ISCO-RR-6-T01N-SFW LOWREGOAT2-T01N-SFW STORM1-D01N-SFW	U CCB-I
Iron (P)	---	---	40.5	---	---	27.8	ISCO-RR-6-D02N-SFW ISCO-RR-6-D03N-SFW	U CCB-I
Zinc (P)	---	---	---	---	15.7	2.0	GHGC-D01N-SFW GHGC-T01N-SFW ISCO-RR-6-D01N-SFW LOWREGOAT2-D01N-SFW LOWREGOAT2-T01N-SFW STORM1-D01N-SFW	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Qualification Codes
ISCO-RR-6-T01N-SFW				
Antimony	37.1	N/A	75-125%	UJ MS-L parent
Lead	64.8			J MS-L parent
Selenium	74.5	71.6		J MS, PDS-L parent
ISCO-RR-6-T04N-SFW				
Sulfate	69.5	N/A	75-125%	J MS-L parent

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification
ISCO-RR-6-T01N-SFW		
Arsenic	14.1	J DL-L parent
Cadmium	18.0	
Molybdenum	17.3	
Selenium	32.9	
ISCO-RR-6-D02N-SFW		
Selenium	17.9	UJ DL-L parent

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT176S

Sampling Event: September 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 01/15/04

Peer Reviewer: Stacey Coker

Date Completed: 01/15/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD_5	COD
SSWC-T01N-SFW	SA	541118		W	X	X	X	X
SSWC-D01N-SFW	SA	541119		W	X			
LOWERREACHCAPULINCANYON-T01N-SFW	SA	541120	LOWRECAPCAN-T01N-SFW	W	X	X	X	X
LOWERREACHCAPULINCANYON-D01N-SFW	SA	541121	LOWRECAPCAN-D01N-SFW	W	X			
HAUTNTAUT-T01N-SFW	SA	541122		W	X	X	X	X
HAUTNTAUT-D01N-SFW	SA	541123		W	X			
HANSEN-T01N-SFW	SA	541124		W	X	X	X	X
HANSEN-D01N-SFW	SA	541125		W	X			

Matrix: W = Water QC Type: SA = Sample FB = Field Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The laboratory case narrative mentioned that the original TDS analysis of sample HANSEN-T01N-SFW was accomplished using a weight above the method prescribed limit. This analysis was repeated six days beyond the prescribed analytical holding time of 7 days. As the data from the second sequence was reported, the TDS result for this sample was qualified as estimated (J). Additionally, the laboratory case narrative noted the original fluoride analyses of the samples in this delivery group were performed at a straight analysis. Due to the fact that these samples were categorized as pH class A samples, the dilution scheme needed to be implemented to compensate for the aluminum concentrations. Accordingly, all samples were re-analyzed at the proper dilution six days beyond the prescribed analytical holding time of 28 days. As the data from the second analyses was presented, all fluoride results were qualified as estimated (J/UJ). Several nitrate, nitrite, orthophosphate, and BOD5 results were qualified as estimated (J/UJ), as some of the analyses were performed several hours beyond the prescribed analytical holding time of 48 hours. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken nine days after sampling and seven days beyond log-in. The pH for all samples was measured approximately 6 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the September 2003 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (A) MMW-45A-T01N • Total vs. Partial Analyses • Cation/Anion Balance	Yes	The internal standard recovery of ^{89}Y was high for the ICPMS analyses of samples LOWERREACHCAPULINCANYON-T01N-SFW and HAUTNTAUT-T01N-SFW. Accordingly, molybdenum results for these samples, as verified by the run-logs, were reported from the trace ICP. In addition, the internal standard recovery of 115In was high for the ICPMS analyses of samples HANSEN-T01N-SFW and HANSEN-D01N-SFW. The analytes associated with this internal standard (arsenic, copper, and nickel) were reported from the trace ICP, as verified by the run-logs. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution analysis on sample SSWC-T01N-SFW was not applicable to any of the 24 analytes, as none of the initial sample results were sufficiently larger (x50) than the IDL (adjusted for a 10-fold and 100-fold dilutions). Accordingly, no qualification on the basis of serial dilution results was necessary. The orthophosphate result for sample HANSEN-T01N-SFW was greater than the total phosphorus beyond the variability to be expected. Table 1.3 details the results and the qualification issued. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with exception of sample

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		RB01T/D-SFW, as described in the case narrative summary. No qualification was considered necessary on the basis of cation/anion balance. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	No	No field QC samples were analyzed with this data package. The field QC results for the September 2003 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. During the cyanide analysis, a slightly low recovery was obtained for the high-level check standard. The cyanide recovery for the 200-ppb check standard #6 was 89.3%, slightly outside the acceptance range of 90-110%. The case narrative noted that the analytical data were still reported and considered acceptable because the recovery of the low standards (50ppb) were acceptable and cyanide was not detected in any samples.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-phosphate (mg/L)	Cond. (µmhos/cm)	pH (std units)	BOD_5 (mg/L)	Fluoride (mg/L)	TDS (mg/L)
SSWC-T01N-SFW	0.60 J	---	---	1710 J	4.2 J	1.4 UJ	---	---
LOWRECAPCAN-T01N-SFW	0.28 J	0.021 J	0.13 J	2710 J	3.3 J	1.4 UJ	21.0 J	---
HAUTNTAUT-T01N-SFW	---	---	---	1610 J	3.0 J	1.4 UJ	2.0 UJ	---
HANSEN-T01N-SFW	---	---	---	3850 J	2.8 J	1.4 UJ	20.7 J	6530 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Iron (P)	49.4	47.8	64.9	89.0	---	27.8	LOWERREACHCAPULINCANYON-D01N-SFW LOWERREACHCAPULINCANYON-T01N-SFW SSWC-T01N-SFW	U CCB-I
Potassium (P)	---	---	---	576.1	---	318.0	HANSEN-D01N-SFW HANSEN-T01N-SFW HAUTNTAUT-D01N-SFW HAUTNTAUT-T01N-SFW SSWC-D01N-SFW SSWC-T01N-SFW	U CCB-I

P=ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs Partial Results Requiring Qualification

Sample	Total Phosphorus (mg/L)	Orthophosphate (mg/L)	Qualification Code
HANSEN-T01N-SFW	0.031 (RL = 0.010)	1.3 (RL = 0.050)	J TvP-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT177A

Sampling Event: Supplemental September 2003 GRW Sampling

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 10/20/03

Peer Reviewer: Stacey Coker

Date Completed: 10/22/03

The table below summarizes the results presented in this data package.

Field ID	pH class	QC Type[1]	Lab ID	Matrix	Analyses	
					Metals	Inorganic
MMW-45A-T01N-GRW	A	SA	542239	W	X	X
MMW-45A-D01N-GRW	A	SA	542240	W	X	
MMW-45B-T01N-GRW	A	SA	542241	W	X	X
MMW-45B-D01N-GRW	A	SA	542242	W	X	
MMW-2-T01N-GRW	B	SA	542243	W	X	X
MMW-2-D01N-GRW	B	SA	542244	W	X	
MMW-3-T01N-GRW	C	SA	542245	W	X	X
MMW-3-D01N-GRW	C	SA	542246	W	X	

Matrix: W = Water

QC Type: SA = Sample FB = Field Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

*These were additional samples collected per the request of the New Mexico Environment Division (NMED) to meet non-RI/FS objectives. While samples were not collected for the RI/FS, it is likely that these data will be included in the RI/FS data set.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The sample log-in sheet noted the pH classes were not listed on the COC. According to the client (URS), the samples were a mixture of class "C" and "A" samples. Although all samples were assigned as class "A" at the time of log-in, the appropriate dilution schemes were run for the different sample classes. (MMW-3 as pH class "C" and MMW-2 as pH class "B"). No data qualification was necessary and completeness was not affected.
Holding Times	No	As none of the sampling times were listed on the chain of custody, the 48-hour holding times could not be accurately assessed for nitrate, nitrite, or orthophosphate initially. The laboratory was contacted and the sampling times were referenced from the bottles. Nitrate, nitrite, and orthophosphate for two samples were analyzed several hours beyond the analytical holding time of 48 hours. Accordingly, the results for these samples for the analytes mentioned above were qualified as estimated (UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken seven days after sampling and five days beyond log-in. The pH for all samples was measured approximately 50 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. Any qualification resulting from the collective assessment of the September 2003 groundwater and surface water sampling event will be extended to the samples in this package so that these results may be incorporated into the RI/FS evaluations if desired.
Method QC • Surrogates • Serial Dilution (A) MMW-45A-T01N-GRWL • Total vs. Partial Analyses • Cation/Anion Balance	No	The internal standard recovery of ^{89}Y was high for the ICPMS analyses of samples MMW-45A-D01N-GRW, MMW-45A-T01N-GRW, MMW-45B-D10N-GRW, MMW-45B-T01N-GRW, MMW-2-D01N-GRW, and MMW-2-T01N-GRW. Accordingly, molybdenum results for these samples, as verified by the run-logs, were reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution analysis on sample MMW-45A-T01N-GRW was only applicable to one of the 24 analytes, as the initial result for manganese was sufficiently larger (x50) than the IDL (adjusted for a ten-fold dilution). The percent difference (%D) between the initial sample result and the serial dilution result (x50 was compared to an evaluation criteria of ±10%). As manganese reported a 0.3% difference between the two results, no qualification was necessary. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with exception of sample MMW-45A-T/D01N-GRW, which reported a slightly elevated percentage of 13.44%. As mentioned in the laboratory case narrative, it was suspected that this elevated cation/anion balance was due to elevated cation reporting limits (potassium and sodium) associated with the "A" dilution scheme. In addition, the sample results were consistent with historical results. No qualification was considered necessary on the basis of cation/anion balance.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	No	No field QC samples were analyzed with this data package. Any qualification resulting from the collective assessment of the September 2003 groundwater and surface water sampling event will be extended to the samples in this package so that these results may be incorporated into the RI/FS evaluations if desired.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (µmhos/cm)	pH
MMW-45A-T01N-GRW	---	---	---	1550 J	3.8 J
MMW-45B-T01N-GRW	---	---	---	2210 J	4.1 J
MMW-2-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	2220 J	5.9 J
MMW-3-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	2080 J	6.8 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Arsenic (MS)	5.9	5.1	5.5	5.9	---	4.1	All samples with the **exception of** : MMW-3-D01N-GRW	U CCB-I
Cadmium (P)	0.5	0.6	0.5	0.6	---	1.3	MMW-3-D01N-GRW MMW-3-T01N-GRW	U CCB-I
Chromium (P)	2.9	2.6	2.6	2.6	---	2.3	MMW-3-D01N-GRW MMW-3-T01N-GRW MMW-2-D01N-GRW MMW-2-T01N-GRW	U CCB-I
Copper (P)	4.1	2.6	2.7	3.0	---	2.3	MMW-3-D01N-GRW MMW-3-T01N-GRW	U CCB-I
Molybdenum (P)	3.5	4.0	3.8	3.6	3.83		MMW-3-D01N-GRW MMW-3-T01N-GRW MMW-45A-D01N-GRW MMW-45A-T01N-GRW MMW-45B-T01N-GRW	U MB CCB-I

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: TAP01 Sampling Event: September 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 09/23/03

Peer Reviewer: Alan Roberts Date Completed: 10/03/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses		
				Metals	Inorganics	Total Uranium[2]
CR-T01N-TAP	SA	540493	W	X	X	X
CR-D01N-TAP	SA	540494	W	X		
P13A-T01N-TAP	SA	540495	W	X	X	X
P13A-D01N-TAP	SA	540496	W	X		
PR2-T01N-TAP	SA	540497	W	X	X	X
PR2-D01N-TAP	SA	540498	W	X		
SUMP5000-T01N-MLW	SA	540499	W	X	X	X
SUMP5000-D01N-MLW	SA	540500	W	X		
PR1-T01N-TAP	SA	540501	W	X	X	X
PR1-D01N-TAP	SA	540502	W	X		
PR1-T01D-TAP	FD	540503	W	X	X	X
PR1-D01D-TAP	FD	540504	W	X		

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]EPA method 6020 for total uranium subcontracted to STL-St. Louis

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The Uranium analyses for the samples in this delivery group were subcontracted to STL St. Louis. This data submittal was included in its entirety at the end of the data package.

The laboratory case narrative noted the metals analysis of the laboratory control sample resulted in a selenium recovery of 74.4%. This recovery was slightly below the acceptance limit of 75-125%, suggesting a potential low bias in the reporting of selenium results. As such, selenium results for all samples were qualified as estimated (J/UJ) with a low bias.

As noted in the laboratory case narrative, the metals prep blank associated with the ICP metals recovered iron above the reporting limit, but below the maximum allowable RL of 500 µg/L, as specified in the QAPP. Two samples were qualified as nondetect due to iron recoveries below 5x the method blank iron concentration (see Table 1.1).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	As noted in the laboratory case narrative and the log-in sheet, the samples in this delivery group were inadvertently forwarded to STL St. Louis by the client (URS). The samples were subsequently forwarded to STL Burlington the following day (09/10/03).
Holding Times	No	All samples were received at STL-Burlington on 09/10/03. As such, the 48-hour holding time for nitrate and nitrite analyses had expired. Accordingly, all nitrate and nitrite results were qualified as estimated (J/UJ) on the basis of holding time, as the prescribed analytical holding time had been exceeded by several hours. Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD PR2-T01N-TAPS PR2-D01N-TAPS • PDS PR2-T01N-TAPA PR2-D01N-TAPA • LD	No	The matrix spike recoveries of nitrite, sulfate, and selenium were below the lower limit of the acceptance range of 75-125% for sample PR2-T01N-TAP. Nitrite was not recovered in any amount in this analysis. The nitrite matrix spike was reanalyzed, resulting in a similar outcome, indicative of sample matrix interference. The nitrite result for the parent sample was accordingly rejected. Selenium was recovered below the acceptance range in the matrix spike analysis of sample PR2-D01N-TAP. These reduced recoveries indicated possible low biases in the reporting of these analytes. The results for post digestion spikes were analyzed for the metal analytes that did not meet the specified criterion for the initial matrix spike recoveries. Selenium was recovered in the post digestion spike analysis for both samples below the lower limit. Accordingly, the parent samples were qualified as estimated on the basis of poor post digestion spike recoveries. Table 1.3 summarizes these analytes along with the associated percent recoveries and the qualification codes assigned to the parent samples. The matrix quality control results for the September 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Internal Standards • Surrogates • Serial Dilution (C) PR2-T01N-TAPSL PR2-D01N-TAPSL • Total vs. Partial Analyses • Cation/Anion Balance	No	The internal standard ^{89}Y recoveries were high for the ICPMS analysis of samples CR-T01N-TAP, SUMP5000-T01N-MLW, and SUMP5000-D01N-MLW. Therefore, beryllium and molybdenum results for these samples, as verified by the run-logs, were reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limits met the requirements of the QAPP such that the change in instrumentation did not affect the usability of the data. The internal standard ^{159}Tb recovery was elevated in the ICPMS analyses of samples CR-T01N-TAP and SUMP5000-T01N-MLW, suggesting a potential high bias in analytes associated with this internal standard. The run-logs verified barium was reported from the trace ICP. Cadmium and antimony were reported from a straight dilution (required for drinking water samples) from the ICP-MS. Accordingly, cadmium was qualified as estimated (J) in sample SUMP5000-T01N-MLW, with a high bias. Antimony results in both samples and cadmium in sample CR-T01N-TAP were nondetect and as such were not qualified. The internal standard ^{6}Li recoveries in samples PR1-T01N-TAP and PR1-D01N-TAP were slightly elevated. The run-logs verified potassium for was reported from the trace ICP. The internal standard ^{115}In reported an elevated recovery in sample CR-T01N-TAP. Accordingly, copper was qualified as estimated (J) with a high bias. The internal standard ^{45}Sc recoveries were high for the ICPMS analysis of samples CR-T01N-TAP, PR1-T01N-TAP, PR1-D01N-TAP, and PR1-D01D-TAP. All analytes associated with this internal standard were reported from the trace ICP, with the exception of selenium and vanadium. Therefore, beryllium and molybdenum results for these samples, as verified by the run-logs, were reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limits met the requirements of the QAPP such that the change in instrumentation did not affect the usability of the data. Table 1.4 summarizes the qualifications assigned to metal analytes on the basis of internal standard recoveries outside the guidelines specified in SOP 12.1. Two serial dilution tests were conducted on matrix spike samples PR2-D01N-TAP and PR2-D01N-TAP. The serial dilution results could not be used to assess potential interferences for 4 of the 24 metals analyzed by ICP since 20 analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. Table 1.5 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. No qualification of data was necessary on the basis of cation/anion imbalance. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	The field QC results for the September 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	The only instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis on blank results. In these cases, the RL was raised to the reported values.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate As N	Nitrite
CR-T01N-TAP	1.5 J	0.0050 UJ
P13A-T01N-TAP	0.26 J	0.0050 UJ
PR2-T01N-TAP	0.62 J	R*
SUMP5000-T01N-MLW	3.0 J	0.0050 UJ
PR1-T01N-TAP	0.62 J	0.0050 UJ
P[R1-T01D-TAP	0.63 J	0.0050 UJ

*The nitrite result for this sample was rejected due to lack of matrix spike recovery

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P)	---	-30.4	---	-30.1	---	23.6	All samples with the **exception** of: SUMP5000-D01N-MLW SUMP5000-T01N-MLW	CCB-L
Beryllium (P)	---	0.3	---	0.4	---	0.2	CR-T01N-TAP	U CCB-I
Copper (P)	---	-2.9	---	---	---	2.4	PR2-D01N-TAP PR2-T01N-TAP	J CCB-L
Iron (P)	---	---	---	---	220.1	33.3	CR-T01N-TAP SUMP5000-T01N-MLW	U MB-I

P=ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Qualification Codes
PR2-T01N-TAP				
Nitrite	0.0	---	75-125%	R
Sulfate	53.8	---		J MS-L parent
Selenium	72.4	73.7		UJ MS, PDS-L parent
PR2-D01N-TAP				
Selenium	73.4	73.5		UJ MS, PDS-L parent

NA = Not appropriate

Table 1.4
Internal Standard Recoveries Resulting in Qualifications

Sample	IS	%R	Analyte	Qualification
CR-T01N-TAP	^{115}In	178.0	Copper	J IS-H
	^{45}Sc	150.4	Vanadium	
PR1-D01D-TAP		120.2		
PR1-D01N-TAP		121.5		
PRI-T01N-TAP		122.6		
SUMP5000-T01N-MLW	^{159}Tb	129.2	Cadmium	

Table 1.5
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification
PR2-T01N-TAP		
Arsenic	13.1	J DL-L parent
Cadmium	11.3	UJ DL-L parent
PR2-D01N-TAP		
Arsenic	12.7	J DL-L parent

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: TAP02 Sampling Event: September 2003

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 09/24/03

Peer Reviewer: Alan Roberts Date Completed: 10/03/03

The table below summarizes the results presented in this data package.

Field ID	QC Type(1)	Lab ID	Matrix	Analyses		
				Metals	Inorganics	Total Uranium[2]
SM5-T01N-TAP	SA	540732	W	X	X	X
SM5-D01N-TAP	SA	540733	W	X		
FM9-T01N-TAP	SA	540734	W	X	X	X
FM9-D01N-TAP	SA	540735	W	X		

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]EPA method 6020 for total uranium subcontracted to STL-St. Louis

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

The Uranium analyses for the samples in this delivery group were subcontracted to STL St. Louis.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	As noted in the laboratory case narrative and the log-in sheet, the samples in this delivery group were inadvertently forwarded to STL St. Louis by the client (URS). The samples were subsequently forwarded to STL Burlington the following day (09/10/03).
Holding Times	No	All samples were received at STL-Burlington on 09/11/03. As such, the 48-hour holding time for nitrate and nitrite analyses had expired. Accordingly, all nitrate and nitrite results were qualified as estimated (J/UJ) on the basis of holding time, as the prescribed analytical holding time had been exceeded by several hours. Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections that resulted in data qualifications.
Matrix QC • MS/MSD • PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the September 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Internal Standards • Surrogates • Serial Dilution (C) SM5-T01N-TAPL • Total vs. Partial Analyses • Cation/Anion Balance	No	One serial dilution analysis was performed on sample SM5-T01N-TAP. The serial dilution results could not be used to assess potential interferences for 20 of the 24 metals analyzed by ICP, as only 2 metal analytes reported initial concentrations greater than 50 times the IDL adjusted for dilution. The %Ds (differences between the initial and 5-fold dilution result) for the applicable metal analytes were reviewed for percentages in excess of ±10%. No qualification was necessary on the basis of serial dilution results. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. No qualification of data was necessary on the basis of cation/anion imbalance. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	The field QC results for the September 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	The only instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis on blank results. In these cases, the RL was raised to the reported values.
Package Completeness	Yes	The data submittal for total uranium was not included with data package TAP02. An electronic copy was received from the laboratory upon request.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate As N	Nitrite
SM5-T01N-TAP	0.25 J	0.0050 UJ
FM9-T01N-TAP	0.25 J	0.0050 UJ

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS)	1.5	1.7	1.4	1.7	1.6	---	0.50	SM5-T01N-TAP	U CCB-I
Molybdenum (MS)	0.7	0.4	0.4	0.4	0.4	-0.354	0.30	All samples	UJ MB, CCB-L

P=ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: TDSRA2 Sampling Event: September 2003 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 4/26/04

Peer Reviewer: Stacey Coker Date Completed: 4/26/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation [2]	Matrix	Analyses
					TDS
RB01T-GRW	RB	540491A		W	X
RB03T-SFW	RB	543040A		W	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Both of the samples were reanalyzed more than 120 days outside of the 8- day holding time due to inconsistent results from the original SDGs, WAT170C and WAT181S, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Method Blanks	Yes	
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB01T-GRW RB03T-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package included two rinsate blank samples. The rinsate blank results satisfied the evaluation criteria in SOP 12.1. The field quality control results for the September 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	TDS (mg/L)
RB01T-GRW	16 J
RB03T-SFW	26 J

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE OCTOBER 2003 QUARTERLY GROUNDWATER AND SURFACE WATER

Prepared for

Molycorp, Inc.
Questa, New Mexico

March 2004

URS

URS Corporation
8181 E. Tufts Avenue
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141568

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.1.1 General Data Quality Issues 3-1
3.1.2 Manual Integration (Organics Only) 3-1
3.1.3 Low-Level Detections (Organics Only) 3-1
3.1.4 TICS Reported In Blanks (Organics Only) 3-1
3.1.5 Dilution Schemes-Non-Detects With Elevated Rls 3-2
3.1.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 3-2
3.1.7 Non-Valid Matrix Spikes 3-2
3.1.8 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Summary/Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.1.1 Groundwater Matrix Spike 4-2
4.1.2 Surface Water Matrix Spike 4-5
4.2 Spike Duplicate Results and Laboratory Duplicates (Precision Evaluation) 4-5
4.2.1 Organic Analyses (MS/MSD Relative Percent Difference [RPD]) 4-5
4.2.2 Metals and Inorganic Laboratory Duplicates 4-6
4.3 Serial Dilution Results 4-7
4.3.1 Groundwater Serial Dilutions 4-7
4.3.2 Surface Water Serial Dilutions 4-8

Section 5 Collective Summary/Assessment of Field QC Results 5-1

5.1 Field Duplicate Samples 5-1
5.1.1 Groundwater Field Duplicate Results 5-2
5.1.2 Surface Water Field Duplicates Results 5-3
5.2 Rinsate Blank Results 5-3
5.2.1 Groundwater Rinsate Blanks 5-4
5.2.2 Surface Water Rinsate Blanks 5-5
5.3 Field Blank Results 5-6

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1

6.3 Completeness 6-1
6.4 Representativeness 6-2
6.5 Comparability 6-2
6.6 Sensitivity 6-2

List of Tables

Table 1-1 Field Identification of Groundwater Samples Collected During October 2003

Table 1-2 Field Identification of Surface Water Samples Collected During October 2003

Table 4-1 Field Samples Submitted for Matrix Spike/Matrix Spike Duplicates

Table 4-2 Count of Matrix Spike Samples Collected in October 2003

Table 4-3 Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Table 4-4 Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Table 4-5 Laboratory Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Table 4-6 Serial Dilution Outliers and Corresponding Results Qualification for Groundwater Samples

Table 4-7 Serial Dilution Outliers and Corresponding Results Qualification for Surface Water Samples

Table 5-1 Water Samples Submitted For Field Duplicate Analyses

Table 5-2 Field Duplicate Collection Frequency for the October 2003 Sampling Event

Table 5-3 Field Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Table 5-4 Rinsate Blanks Collected During the October 2003 Sampling Event

Table 5-5 Groundwater Rinsate Blank Outliers and Corresponding Results Qualification for Groundwater Samples Collected During October 2003

Table 5-6 Surface Water Rinsate Outliers and Corresponding Results Qualification for Groundwater Samples

TABLE OF CONTENTS

List of Attachments

Attachment 1.1 Data Package WAT186S
Attachment 1.2 Data Package WAT196C
Attachment 1.3 Data Package WAT200C
Attachment 1.4 Data Package WAT201A (Inorganics Only)
Attachment 1.5 Data Package WAT202C
Attachment 1.6 Data Package WAT203C
Attachment 1.7 Data Package WAT204C
Attachment 1.8 Data Package WAT205C
Attachment 1.9 Data Package WAT206A
Attachment 1.10 Data Package WAT207A
Attachment 1.11 Data Package WAT208C
Attachment 1.12 Data Package WAT209C
Attachment 1.13 Data Package WAT210S
Attachment 1.14 Data Package WAT211C
Attachment 1.15 Data Package WAT212A
Attachment 1.16 Data Package WAT213C
Attachment 1.17 Data Package WAT214A
Attachment 1.18 Data Package WAT215C
Attachment 1.19 Data Package WAT216S
Attachment 1.20 Data Package WAT217A
Attachment 1.21 Data Package WAT218C
Attachment 1.22 Data Package WAT219C
Attachment 1.23 Data Package WAT220A
Attachment 1.24 Data Package WAT221C
Attachment 1.25 Data Package WAT222A
Attachment 1.26 Data Package WAT223A
Attachment 1.27 Data Package WAT224A
Attachment 1.28 Data Package US2RA (Metals Only)

This data validation report is intended to provide the reader with a general overview of the usability of chemical data obtained from the October 2003 sampling activities at Molycorp. In addition, this data validation report is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

This report contains the results of the data validation conducted for groundwater samples collected in October of 2003 at the Molycorp Questa Mine, Questa, New Mexico. These water samples were collected in support of the Remedial Investigation/Feasibility Study (RI/FS). The water samples were sent to Severn Trent Laboratories (STL) Burlington in Colchester, VT. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods used and quality control samples collected were in accordance with the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). The results were reported in 26 original data packages

The groundwater and surface water samples collected during the October 2003 sampling event and their associated chemical analyses are summarized in Tables 1-1 and 1-2, respectively. Included in these tables is the frequency of QC sample s collected for each matrix.

Table 1-1
Field Identification of Groundwater Samples Collected During October 2003

Sample Identification	SDG	Dissolved Metals	Total Metals	Inorganics	Volatile Organics	Explosives
LS1-T01N-GRW	WAT196C	X	X	X		
MW-1-T01N-GRW	WAT196C	X	X	X		
MW-9A-T01N-GRW	WAT196C	X	X	X		
US-3-T01N-GRW	WAT196C	X	X	X		
US-1-T01N-GRW	WAT196C	X, FD	X, FD	X, FD		
LS2-T01N-GRW	WAT200C	X, MS, LD	X, MS, LD	X, MS, LD		
LS3-T01N-GRW	WAT200C	X	X	X		
MW-23-T01N-GRW	WAT200C	X	X	X		
MW-22-T01N-GRW	WAT200C	X	X	X		
MW-4-T01N-GRW	WAT200C	X, MS, LD	X, MS, LD	X, MS, LD		
MW-15-T01N-GRW	WAT200C	X	X	X		
MW-12-T01N-GRW	WAT200C	X	X	X		
MW-11-T01N-GRW	WAT200C	X	X	X		
MW-13-TO1N-GRW	WAT200C	X	X	X		
US-2-T01N-GRW	WAT201A			X		
MINE-1-T01N-GRW	WAT202C	X, FD	X, FD	X, FD		
MW-CH-T01N-GRW	WAT203C	X	X	X		
MW-10-T01N-GRW	WAT203C	X	X	X		
MW-24-T01N-GRW	WAT203C	X	X	X		
MW-28-T01N-GRW	WAT203C	X	X	X		
EW-5C-T01N-GRW	WAT203C	X	X	X		
MW-7C-T01N-GRW	WAT203C	X	X	X		
MW-7A-T01N-GRW	WAT203C	X	X	X		
MW-25-T01N-GRW	WAT203C	X	X	X		
MW-2-T01N-GRW	WAT203C	X	X	X		

Table 1-1
Field Identification of Groundwater Samples Collected During October 2003

Sample Identification	SDG	Dissolved Metals	Total Metals	Inorganics	Volatile Organics	Explosives
MW-B-T01N-GRW	WAT203C	X	X	X		
MW-29-T01N-GRW	WAT203C	X, RB	X, RB	X, RB		
EW-6-T01N-GRW	WAT204C	X	X	X		
EW-5D-T01N-GRW	WAT204C	X	X	X		
MW-A-T01N-GRW	WAT204C	X, FD	X, FD	X, FD		
MW-26-T01N-GRW	WAT204C	X	X	X		
EW-1-T01N-GRW	WAT204C	X	X	X		
MW-21-T01N-GRW	WAT204C	X, RB	X, RB	X, RB		
MW-14-T01N-GRW	WAT205C	X, RB	X, RB	X, RB		
MW-27-T01N-GRW	WAT205C	X	X	X		
P-5B-T01N-GRW	WAT206A	X	X	X		
P-5C-T01N-GRW	WAT206A	X	X	X		
MMW-42A-T01N-GRW	WAT206A	X, FD	X, FD	X, FD		
P-2-T01N-GRW	WAT206A	X, MS, LD	X, MS, LD	X, MS, LD		
P-3-T01N-GRW	WAT206A	X	X	X		
COLUMBINENO1-T01N-GRW	WAT206A	X	X	X		
COLUMBINENO2-T01N-GRW	WAT206A	X	X	X		
P-4B-T01N-GRW	WAT206A	X	X	X		
MMW-47A-T01N-GRW	WAT206A	X	X	X		
MMW-31A-T01N-GRW	WAT207A	X	X	X		
MMW-17A-T01N-GRW	WAT207A	X, MS, LD	X, MS, LD	X, MS, LD		
MMW-17B-T01N-GRW	WAT207A	X	X	X		
MMW-48A-T01N-GRW	WAT207A	X	X	X		
MMW-45A-T01N-GRW	WAT207A	X	X	X		
P-1-T01N-GRW	WAT207A	X, RB	X, RB	X, RB		
MMW-45B-T01N-GRW	WAT207A	X, RB	X, RB	X, RB		
EW-4-T01N-GRW	WAT208C	X	X	X		
MW-17-T01N-GRW	WAT208C	X	X	X		
EW-5B-T01N-GRW	WAT208C	X, MS, LD	X, MS, LD	X, MS, LD		
MW-20-T01N-GRW	WAT208C	X	X	X		
EW-2-T01N-GRW	WAT208C	X	X	X		
EW-3-T01N-GRW	WAT208C	X	X	X		
COMPANYCABINSWELL-T01N-GRW	WAT209C	X	X	X		
MMW-42B-T01N-GRW	WAT209C	X	X	X		
FAGERQUISTWELL-T01N-GRW	WAT209C	X, FD	X, FD	X, FD		
LABWELL-T01N-GRW	WAT209C	X, MS, LD	X, MS, LD	X, MS, LD		
MMW-8A-T01N-GRW	WAT209C	X	X	X		
MMW-3-T01N-GRW	WAT209C	X, RB	X, RB	X, RB		
MMW-2-T01N-GRW	WAT209C	X	X	X		
MMW-31B-T01N-GRW	WAT209C	X	X	X		
MMW-30B-T01N-GRW	WAT211C	X, FD, MS, LD	X, FD, MS, LD	X, FD, MS, LD	X, FD, FB, MS, LD	X, FD, FB, MS, LD
MMW-44B-T01N-GRW	WAT211C	X	X	X		
MMW-13-T01N-GRW	WAT211C	X	X			
MMW-21-T01N-GRW	WAT212A	X	X	X		
MMW-7-T01N-GRW	WAT212A	X	X	X		
MMW-22-T01N-GRW	WAT212A	X	X	X		

Table 1-1
Field Identification of Groundwater Samples Collected During October 2003

Sample Identification	SDG	Dissolved Metals	Total Metals	Inorganics	Volatile Organics	Explosives
MMW-30A-T01N-GRW	WAT212A	X	X	X		
MMW-27A-T01N-GRW	WAT212A	X	X	X		
MMW-44A-T01N-GRW	WAT212A	X	X	X		
MMW-36B-T01N-GRW	WAT212A	X	X	X		
MMW-8B-T01N-GRW	WAT212A	X, RB	X, RB	X, RB		
SPRING14T-T01N-GRW	WAT213C	X	X	X		
SPRING18-T01N-GRW	WAT213C	X	X	X		
SPRING15T-T01N-GRW	WAT213C	X	X	X		
SPRING17-T01N-GRW	WAT213C	X, FD	X, FD	X, FD		
SPRING9-T01N-GRW	WAT213C	X	X	X		
SPRING12-T01N-GRW	WAT213C	X	X	X		
SPRING12A-T01N-GRW	WAT213C	X	X	X		
003 CENTRAL SEEP-T01N-GRW	WAT213C	X	X	X		
MMW-19B-T01N-GRW	WAT213C	X	X	X		
DOUGLASWELL-T01N-GRW	WAT214A	X	X	X		
MMW-11-T01N-GRW	WAT214A	X	X	X		
MMW-11A-T01N-GRW	WAT214A	X	X	X		
MMW-19A-T01N-GRW	WAT214A	X	X	X		
MMW-24-T01N-GRW	WAT214A	X	X	X		
MMW-10C-T01N-GRW	WAT214A	X, FD	X, FD	X, FD		
MMW-10B-T01N-GRW	WAT214A	X	X	X		
EMBARGOROADSEEP-T01N-GRW	WAT215C	X	X	X		
SPRING9A-T01N-GRW	WAT215C	X	X	X		
SPRING10-T01N-GRW	WAT215C	X	X	X		
003 EASTSEEP-T01N-GRW	WAT215C	X	X	X		
003 WESTSEEP-T01N-GRW	WAT215C	X	X	X		
EASTSEEP-T01N-GRW	WAT215C	X	X	X		
WESTSEEP-T01N-GRW	WAT215C	X	X	X		
OUTFALL002-T01N-GRW	WAT216S	X	X	X		
OUTFALL002PIPE-T01N-GRW	WAT216S	X	X	X		
MMW-23A-T01N-GRW	WAT217A	X, MS, LD	X, MS, LD	X, MS, LD		
CAPULIN1-T01N-GRW	WAT217A	X	X	X		
SPRING14MA-T01N-GRW	WAT217A	X	X	X		
CAPULINSPRING-T01N-GRW	WAT217A	X, MS, LD	X, MS, LD	X, MS, LD		
SC-1A-T01N-GRW	WAT217A	X	X	X		
WALDOSPRING-T01N-GRW	WAT217A	X	X	X		
GOATHILLSPRING-T01N-GRW	WAT217A	X	X	X		
SULFURGULCHSEEP-T01N-GRW	WAT217A	X	X	X		
SPRING14M-T01N-GRW	WAT217A	X	X	X		
UPPERSPRING39-T01N-GRW	WAT217A	X	X	X		
MMW-34B-T01N-GRW	WAT217A	X	X	X		
MMW-32A-T01N-GRW	WAT217A	X	X	X		
TPZ-2-T01N-GRW	WAT218C	X	X	X		
TPZ-1-T01N-GRW	WAT218C	X	X	X		
TPZ-5B-T01N-GRW	WAT218C	X	X	X		
MMW-29B-T01N-GRW	WAT219C	X	X	X		

Table 1-1
Field Identification of Groundwater Samples Collected During October 2003

Sample Identification	SDG	Dissolved Metals	Total Metals	Inorganics	Volatile Organics	Explosives
MMW-18B-T01N-GRW	WAT219C	X	X	X		
MMW-23B-T01N-GRW	WAT219C	X	X	X		
CHAMBERSPRING-T01N-GRW	WAT219C	X	X	X		
SC-1B-T01N-GRW	WAT219C	X	X	X		
MMW-32B-T01N-GRW	WAT219C	X	X	X		
MMW-25B-T01N-GRW	WAT219C	X	X	X		
MMW-39A-T01N-GRW	WAT220A	X	X	X		
MMW-35B-T01N-GRW	WAT220A	X	X	X		
MMW-28B-T01N-GRW	WAT220A	X	X	X		
MMW-40A-T01N-GRW	WAT220A	X	X	X		
HOTTENTOT-T01N-GRW	WAT220A	X	X	X		
HANSEN-T01N-GRW	WAT220A	X	X	X		
SC-7A-T01N-GRW	WAT220A	X	X	X		
SC-3A-T01N-GRW	WAT220A	X	X	X		
SC-5A-T01N-GRW	WAT220A	X	X	X		
LOWERSPRING13-T01N-GRW	WAT220A	X, RB	X, RB	X, RB		
SC-8A-T01N-GRW	WAT221C	X	X	X		
MMW-43A-T01N-GRW	WAT221C	X	X	X		
EW-5A-T01N-GRW	WAT221C	X	X	X		
SC-5B-T01N-GRW	WAT221C	X	X	X		
SC-6A-T01N-GRW	WAT222A	X	X	X		
SC-3B-T01N-GRW	WAT222A	X	X	X		
SC-4A-T01N-GRW	WAT222A	X	X	X		
MMW-49A-T01N-GRW	WAT222A	X	X	X		
MMW-38A-T01N-GRW	WAT222A	X	X	X		
MMW-33A-T01N-GRW	WAT223A	X	X	X		
MMW-10A-T01N-GRW	WAT223A	X	X	X		
MMW-28A-T01N-GRW	WAT223A	X	X	X		
AWWT-1-T01N-GRW	WAT223A	X	X	X		
MMW-29A-T01N-GRW	WAT223A	X, FD	X, FD	X, FD		
LABOBITA-T01N-GRW	WAT223A	X	X	X		
CC1A-T01N-GRW	WAT224A	X	X	X		
CC1B-T01N-GRW	WAT224A	X	X	X		
AWWT-2-T01N-GRW	WAT224A	X	X	X		
CC2A-T01N-GRW	WAT224A	X	X	X		
CC2B-T01N-GRW	WAT224A	X	X	X		
US-2-T01N-GRW	US2RA	X	X			
Number GRW samples		153	153	153	1	1
Number MS/MSD or MS/LD		9	9	9	1	1
Number Field Duplicates		9	9	9	1	1
Number Rinsate Blanks		8	8	8	0	0
Number Field Blanks		NA	NA	NA	1	1

NS = Not Sampled MS/MSD = Matrix Spike/Matrix Spike Duplicate NA = Not Applicable
RB = Rinsate Blank FD = Field Duplicate FB = Field Blank GRW = Groundwater

Notes:

1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".
2. Shaded cells denote new locations sampled for the first time in October 2003.

Table 1.2
Field Identification of Surface Water Samples Collected During October 2003

Analyses	SDG	Total Metals	Dissolved Metals	Inorganics	DRO
LOWERREACHOFGOATHILL-T01N-SFW	WAT186S	X	X	X	
GHGCPONDT01N-SFW	WAT186S	X	X	X	
RR-14-T01N-SFW	WAT210S	X	X	X	
RR-16-T01N-SFW	WAT210S	X	X	X	
RR-11C-T01N-SFW	WAT210S	X	X	X	
RR-11A1-T01N-SFW	WAT210S	X	X	X	
RR-10-T01N-SFW	WAT210S	X	X	X	
RR-10A1-T01N-SFW	WAT210S	X	X	X	
RR-7-T01N-SFW	WAT210S	X	X	X	
RR-13-T01N-SFW	WAT210S	X	X	X	
RR-12-T01N-SFW	WAT210S	X	X	X	
DECANT-T01N-SFW	WAT216S	X	X	X	X
Number SFW samples		12	12	12	1
Number MS/MSD or MS/LD		NS	NS	NS	NS
Number Field Duplicates		NS	NS	NS	NS
Number Rinsate Blanks		NS	NS	NS	NS
Number Field Blanks		NS	NS	NS	NS

NS = Not Sampled SFW = Surface water

Notes:

1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

The surface water QC samples for the routine quarterly sampling event were planned at locations RR-US-Spring 13 (FD), RR-US-Spring 39 (MS/LD), and RR-DS-Spring 39 (RB). However, these locations were not sampled because the pumps associated with the spring seepage interception system were not functioning properly. As sampling of these three stations was scheduled for the last day of the event, surface water QC samples were not collected during the routine quarterly sampling event. However, there was another sampling event in October 2003, the Groundwater/Surface Water Interaction Study (GSI), for which surface water QC samples were collected.

Because the QC samples for the GSI study (conducted October 6th –10th), were collected within 14 days of the surface water sample collected during the routine quarterly sampling event (October 19th), the QC samples collected during the earlier event were considered applicable to the later event. During the GSI study, a total of 30 surface water samples were collected along with 2 sets of QC samples. As 12 surface water samples were collected during the routine quarterly sampling event, the number of QC samples collected for these pooled events (2 sets for a total of 42 surface water samples) was 4.8%. The QAPP frequency requirement is 5%, using professional judgment, no qualifications of data were considered necessary.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, Inductively Coupled Plasma Spectroscopy (ICP) serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1, and is as follows: If no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used. If no criteria are specified in the SOP or the QAPP then the method-specified acceptance limits were used. If no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

Whenever professional judgment was exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative. Section 4 and Attachment 1, provide the data review narratives for each of the data packages

After completing the review sample-specific and laboratory performance parameters in accordance with SOP 12.1, the site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. The reason for this is that site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Where applicable, the potential direction of bias (high, low, or indeterminate) has been indicated on the tables in the text, and noted on the sample results sheets as H, L, or I, respectively. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 6.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

3.1 DATA REVIEW NARRATIVES

The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries which are included in Attachment 1. The data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files. All data validation qualifiers, reason codes and bias codes are stored in the electronic database.

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. The October, 2003 groundwater and surface water sample results were reported in 27 original data packages, including Sample Delivery Groups (SDGs) WAT186S, WAT196C, WAT200C through WAT224A, and US2RA. All samples were reviewed for the sample-specific criteria described in Section 2.0. Laboratory performance parameters were evaluated on data packages WAT211C, WAT216S, and WAT224A. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters that exceeded acceptance criteria during the laboratory performance criteria review

3.1.1 General Data Quality Issues

During the data review process, several issues were identified which globally affected all relevant water samples analyzed for the October 2003 Groundwater /Surface Water Sampling Event. Although these issues may have been addressed in the individual data review summary reports, it was considered necessary to summarize them this data validation report.

3.1.2 Manual Integration (Organics Only)

Manual integration was employed in deriving results for the volatile and semivolatile organics in all data packages. The values that were derived from manual integration were qualified on the quantitation reports and extracted ion current profiles were included for each occurrence. Since adequate documentation was provided, no action was deemed necessary.

3.1.3 Low-Level Detections (Organics Only)

Detected organic analytes with concentrations between the Method Detection Limit (MDL) and the Reporting Limit (RL) were qualified as estimated (J). A qualifier code of “SQL-I” (Sample Quantitation Limit) was assigned to reflect the greater uncertainty in quantitative values below the RL.

3.1.4 TICS Reported in Blanks (Organics Only)

Several Tentatively Identified Compounds (TICs) were reported as present in the semivolatile blanks for each package in which semivolatile data were analyzed. TICs in method blanks are not considered to be reportable as TICs for samples and such identifications were rejected, flagged as unusable (R). The multiple unknown compounds not detected in the method blank were qualified as (NJ) to not the analyses indicated the presence of an analyte that had been “tentatively identified” and thee associated numerical value represented its approximate value.

No qualification of organic target analytes (volatile or semivolatile) was necessary on the basis of method blank detections.

3.1.5 Dilution Schemes-Non-Detects with Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

3.1.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgement, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the analyses. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assess for accuracy of the analysis.

3.1.7 Non-Valid Matrix Spikes

There were a total of three scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. First, when native sample concentrations were greater than or equal to four times the spiking concentration, the ability to determine accuracy in the analysis was not accurate as the difference in the spike level with the original analyte concentration was not so discernable due to high concentration levels. In addition, there were several instances in which the reporting limits for various metal analytes were increased due to dilution factors, which affected the reliable quantitation of several spiked metals. In these situations, the reporting limit was greater than the spike concentration added. Related to this scenario, is the last instance in which the difference between the RL concentration and the spike concentration was less than the RL value.

3.1.8 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL data packages WAT211C, WAT216S, and WAT224A were used to evaluate laboratory performance criteria. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. Based on the review of laboratory performance criteria, no review of laboratory performance parameters in other packages was not necessary.

The site-specific Matrix Spike/Matrix Spike Duplicate (MS/MSD) results, method duplicate (MD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three sections present a discussion on the MS/MSD analyses, MD analyses, and the serial dilution results for the groundwater and surface water samples collected during the October, 2003 sampling event.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Additional aliquots of nine groundwater and 2 surface waters samples were submitted for use in matrix QC analyses. Table 4-1 below summarizes the site-samples that were used to prepare matrix spike and matrix spike duplicate samples.

Table 4-1
Field Samples Submitted for Matrix Spike/Matrix Spike Duplicates

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Explosives
LS-2-T01N-GRW	Groundwater	WAT200C	X	X	X		
MW-4-T01N-GRW	Groundwater	WAT200C	X	X	X		
P-2-T01N-GRW	Groundwater	WAT206A	X	X	X		
MMW-17A-T01N-GRW	Groundwater	WAT207A	X	X	X		
EW-5B-T01N-GRW	Groundwater	WAT208C	X	X	X		
LABWELL-T01N-GRW	Groundwater	WAT209C	X	X	X		
MMW-30B-T01N-GRW	Groundwater	WAT211C	X	X	X	X	X
MMW-23A-T01N-GRW	Groundwater	WAT217A	X	X	X		
CAPULINSRPING-T01N-GRW	Groundwater	WAT217A	X	X	X		
RR-5BB-T00N-SFW	Surface water	WAT187S	X	X	X		
RR-15-T01N-SFW	Surface water	WAT188S	X	X	X		

Notes:
1. For Metals and Inorganic analyses, a single matrix spike sample was analyzed.
2. For Organic analyses, duplicate matrix spike samples were analyzed.
3. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

Table 4-2 lists the groundwater and surface water MS/MD sample sets relative to the number of field samples.

Table 4-2
Count of Matrix Spike Samples Collected in October, 2003

Analyses	Number of MS samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	9	153	6
Dissolved Metals	9	153	6
Inorganics	9	153	6
VOC	1	1	100
Explosives	1	1	100
Surface Water			
Total Metals	2	12	17
Dissolved Metals	2	12	17
Inorganics	2	12	17
VOC	NA	NA	NA
Explosives	NA	NA	NA

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

A number of spike recoveries were outside of the QC acceptance limits of 75%-125%. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent sample results were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

4.1.1 Groundwater Matrix Spike

Although the majority of the groundwater matrix spike recoveries were within acceptance limits, some were not. Table 4-3 summarizes the spike recoveries that were outside acceptance limits and the subsequent result qualification applied to the associated samples.

Table 4-3
Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte (Control Limits %)	Sample ID	MS% Recovery	Average %Rs	Frequency of Limit Exceedance*	Action
Metals					
Total Antimony	CAPULINSRPING-T01N-GRW	69.0	95.9	1 of 9 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Dissolved Antimony	CAPULINSRPING-D01N-GRW	68.0	88.0	1 of 9 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)

Table 4-3
Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte (Control Limits %)	Sample ID	MS% Recovery	Average %Rs	Frequency of Limit Exceedance*	Action
Total Arsenic	CAPULINSRPING-T01N-GRW	67.6	103.4	1 of 8 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Dissolved Arsenic	CAPULINSRPING-D01N-GRW	70.8	88.9	2 of 9 Applicable	Qualify parent sample result as estimated (J/UJ MS-L or JMSH)
	MWW-17A-D01N-GRW	135.4			
Total Barium	CAPULINSRPING-T01N-GRW	63.6	95.7	1 of 9 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Dissolved Barium	CAPULINSRPING-D01N-GRW	66.6	87.4	1 of 9 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Total Beryllium	CAPULINSRPING-T01N-GRW	64.9	99.4	1 of 9 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Total Boron	CAPULINSRPING-T01N-GRW	69.0	98.0	1 of 9 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Dissolved Cadmium	P-2-D01N-GRW	28.4	78.1	1 of 6 Applicable	Qualify parent sample result as rejected (J/UJ MS-R)
Total Chromium	P-2-T01N-GRW	53.8	89.2	3 of 9 Applicable	Qualify all total chromium results as estimated (J/UJ MS-I). The total chromium result for sample MMW-17A-T01N-GRW was qualified as rejected (R MS-L)
	MMW-17A-T01N-GRW	0.0			
	CAPULINSRPING-T01N-GRW	135.8			
Dissolved Chromium	MMW-17A-D01N-GRW	0	90.5	2 of 8 Applicable	Qualify all dissolved chromium results as estimated (J/UJ MS-I). The dissolved chromium result for sample MMW-17A-D01N-GRW was qualified as rejected (R MS-L)
	CAPULINSRPING-D01N-GRW	135.6			
	P-2-D01N-GRW	137.2			
Total Copper	P-2-T01N-GRW	56.7	100.6	1 of 9 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Dissolved Copper	P-2-D01N-GRW	53.4	85.9	1 of 8 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Total Iron	MW-4-T01N-GRW	126.8	92.7	1 of 6 Applicable	Qualify parent sample result as estimated (J/UJ MS-H)
Total Selenium	MMW-30B-T01N-GRW	38.4	86.9	1 of 8 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Dissolved Selenium	MMW-30B-D01N-GRW	38.0	79.9	1 of 7 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Total Molybdenum	CAPULINSRPING-T01N-GRW	58.1	95.2	1 of 9 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Dissolved Molybdenum	CAPULINSRPING-D01N-GRW	58.4	87.9	1 of 9 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Total Nickel	MMW-17A-T01N-GRW	48.7	92.1	1 of 8 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Dissolved Nickel	MMW-17A-D01N-GRW	0.0	84.2	2 of 8 Applicable	Qualify parent sample result for MMW-17A as rejected (R MS-L) NQ for P2 because sample results was nondetect
	P-2-D01N-GRW	138.8			

Table 4-3
Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte (Control Limits %)	Sample ID	MS% Recovery	Average %Rs	Frequency of Limit Exceedance*	Action
Total Cyanide (75-125)	P-2-T01N-GRW	33.8	71.9	4 of 9 Applicable	Qualify all total cyanide results as estimated (J/UJ MS-L)
	MMW-30B-T01N-GRW	47			
	MMW-23A-T01N-GRW	74			
	CAPULINSRPING-T01N-GRW	36.1			
Inorganics					
Sulfate	LS-2-T01N-GRW	67.0	77	4 of 9 Applicable	Qualify all sulfate results as estimated (J/UJ MS-L)
	MW-4-T01N-GRW	69.4			
	EW-5B-T01N-GRW	69.2			
	LABWELL-T01N-GRW	49.6			
TOC	LS-2-T01N-GRW	138	104	3 of 9 Applicable	Qualify all TOC results as estimated (J/UJ MS-L)
	MMW-30B-T01N-GRW	60			
	CAPULINSRPING-T01N-GRW	53			
Phosphorus	CAPULINSRPING-T01N-GRW	17.6	91	1 of 9 Applicable	Qualify parent sample result as estimated (J/UJ MS-L)
Nitrite	MMW-30B-T01N-GRW	9.5	79	2 of 9 Applicable	Qualify parent sample results as estimated (J/UJ MS-L)
	CAPULINSRPING-T01N-GRW	0			
Ammonia	P-2-T01N-GRW	70.1	78	4 of 9 Applicable	Qualify all ammonia results as estimated (J/UJ MS-L)
	EW-5B-T01N-GRW	74.4			
	MMW-30B-T01N-GRW	70.8			
	MMW-23A-T01N-GRW	67.2			
Total Alkalinity	P-2-T01N-GRW	40.6	78	4 of 9	None[1]
	MMW-17A-T01N-GRW	61.8			
	MMW-23A-T01N-GRW	74.0			
	CAPULINSRPING-T01N-GRW	2.0			
VOC All results were within criteria					
Explosives					
PYX	MMW-30B-T01N-GRW	80/58	69	1 of 1	Qualify parent sample result as estimated (J/UJ MS-L)

[1] Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the accepted range of 75-125% in the sample specific reviews. However, using professional judgement, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses are not a pertinent measure of accuracy. The highly variable pH range of the water and the associated carbonate species equilibria was found to affect the matrix spike recoveries more than the expected accuracy of the analysis. The matrix spiked samples were found to have significantly different pHs than the parent samples, due to the presence of carbonate confounded by a dilution effect.

Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy of the analysis.

Data qualification for total chromium, dissolved chromium, total cyanide, sulfate, ammonia and TOC was extended to all samples because greater than a quarter of the field duplicate results were outside the applicable evaluation criterion. For sample MMW17A-T01N-GRW and MMW-17A-D01N-GRW the chromium results were qualified as rejected since the recoveries were below 30%. Also for sample P-2-D01N-GRW the dissolved cadmium result was qualified as rejected since the result was below 30%. Although the outlying nitrite and phosphorus results were below 30%, the average recoveries were within criteria. Therefore the positive parent sample results were qualified as estimated (J/UJ MS-L) for nitrite and phosphorus.

Although some results were qualified based on field duplicate agreement, the vast majority (>90%) of the matrix spike results were within limits.

4.1.2 Surface Water Matrix Spike

Although the majority of the surface water matrix spike recoveries were within acceptance limits, some were not. Table 4-4 summarizes the spike recoveries that were outside acceptance limits and the subsequent result qualification applied to the associated samples.

Table 4-4
Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Analyte (Control Limits %)	Sample ID	MS or MS and MSD or MS (PDS) (%R)	Frequency of Limit Exceedance	Action
Total and Dissolved Metals				
All results were within criteria				
Inorganics				
Sulfate	RR-15-T01N-SFW	66	1 of 2	J/UJ MS-L for all sulfate results.

For each of the analytes listed in the table above, it was considered necessary to extend qualification to the balance of the October 2003 surface water samples because more than a quarter of the spike results were outside evaluation criteria.

Although results for some analytes were qualified based on matrix spike recoveries, none warranted rejection. Additionally, the vast majority (>99%) of matrix spike results were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

4.2 SPIKE DUPLICATE RESULTS AND LABORATORY DUPLICATES (PRECISION EVALUATION)

The following subsections to the precision of analytical results based on their reproducibility. Section 4.2.1 discusses the organic analyses for which precision was evaluated by analysis of duplicate spiked samples. Section 4.2.2 discusses the metals and inorganic analyses for which precision was evaluated by the analysis of laboratory duplicates.

4.2.1 Organic Analyses (MS/MSD Relative Percent Difference [RPD])

The relative percent differences between MS and MSD results for target analytes contained in the spiking solutions used by the laboratory were within QAPP acceptance limits. No ground water results were qualified based on the RPD between the MS and the MSD results. As such, the precision of the organic analyses relative to the site-specific matrix is considered to be acceptable. No surface water samples were analyzed for organic analytes.

4.2.2 Metals and Inorganic Laboratory Duplicates

The laboratory duplicate sample analysis results are used to evaluate the precision of the laboratory analyses. The evaluation criteria used are dependent on the concentration of the analyte in the sample. Acceptable precision is demonstrated by an RPD≤20% when both results are more that five times the reporting limit (RL). When either sample concentration is ≤5xRL, acceptable precision is demonstrated by an absolute difference between results of ≤1xRL. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was used as the RL for these concentration dependent evaluations because the laboratory used the IDLs as the quantitative RLs. The IDLs are considered to be too low for such comparisons to be meaningful. Additionally, using the CLP CRDL is consistent with The National Functional Guidelines, which were used as guidance for data review in addition to SOP 12.1

4.2.2.1 Groundwater Laboratory Duplicate

With the following exceptions, all laboratory duplicate recoveries were within the laboratory acceptance limits. Table 4-5 below lists the groundwater laboratory duplicate results outside the laboratory acceptance limits and the result qualifiers applied.

Table 4-5
Laboratory Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Analyte (20% or 1xRL)	Sample ID	RPD or Difference	Frequency of Limit Exceedance	Action
Metals				
Dissolved Copper[1]	MW-4-D01N-GRW	AD =116	1 of 7 Applicable	Qualified parent result as estimated (J D-I)
Inorganics				
TDS	MMW-30B-T01N-GRW	RPD = 72%	1 of 9 Applicable	Qualified parent result as estimated (J D-I)
Chloride	CAPULINSPRING-T01N-GRW	RPD = 38%	1 of 9 Applicable	Qualified parent result as estimated (J D-I)
Total Alkalinity	MMW-23A-T01N-GRW	RPD = 25%	1 of 9 Applicable	Qualified parent result as estimated (J D-I)
Ammonia	P-2-T01N-GRW	RPD = 47%	2 of 8 Applicable	Qualified parent result as estimated (J D-I)
	CAPULINSPRING-T01N-GRW	RPD = 21%		

[1] While the laboratory duplicate results did not exhibit good agreement (188 ug/l vs. 2.0 ug/l), the initial sample results was rejected because it did not agree with the total copper result nor any of the historic results. The value for the duplicate sample, 2.0 ug/l, was substituted for the outlying initial result.

Although some laboratory duplicate results were out, exceedances were generally single occurrences with the exception of ammonia. For ammonia, a quarter of the LD results were out, but for one, the exceedance was marginal. For these reasons, qualification was limited to the parent samples. The laboratory duplicate results are considered to be indicative of acceptable precision.

4.2.2.2 Surface Water Laboratory Duplicate

All surface water laboratory duplicate results satisfied the applicable evaluation criterion. Therefore, no qualifications of data were necessary on the basis of laboratory duplicate results.

As such, the laboratory duplicate results are considered to indicated that acceptable levels of overall precision (sampling and analytical) were attained on the site-specific matrix.

4.3 SERIAL DILUTION RESULTS

ICP serial dilutions are analyzed to help evaluate whether or not interferences exist due to sample matrix. When analyte concentrations are sufficiently high (defined as minimally 50x greater than the instrument detection limit [IDL]), results for a straight and five fold dilution are expected to agree within 10%. Otherwise interferences resulting in signal suppression or enhancement might be suspected.

In general, qualification was limited to the parent sample if fewer than a quarter of the applicable serial dilution results were outside the acceptance range. Conversely, if more than a quarter of the applicable serial dilution results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average %D, the magnitude of the exceedances, and the number of valid results relative to the size of the sample set.

4.3.1 Groundwater Serial Dilutions

Table 4-6 below lists the number of applicable groundwater samples that were used to perform serial dilution tests and analytes for which the evaluation was applicable. With three exceptions denoted in the table below, the percent differences (%Ds) between the original sample results and the result obtained from a five-fold diluted sample were all <10%.

Table 4-6
Serial Dilution Outliers and Corresponding Results
Qualification for Groundwater Samples

Analyte	Total				Dissolved				Action
	Avg. %D	%Ds >10%	# of Valid Results	% Valid Result >10%	Avg. %D	%Ds >10%	# of Valid Results	% Valid Result >10%	
GROUNDWATER									
Aluminum	5.1	0	4	0	3.6	0	2	0	None
Antimony	1.8	0	5	0	3.8	0	5	0	None
Arsenic	3.6	0	2	0	6.0	0	3	0	None
Barium	2.7	0	5	0	2.2	0	5	0	None
Beryllium	8.4	2	9	22%	6.1	1	7	14%	Parent only J/UJ DL-L (Total and Dissolved)
Boron	3.9	0	5	0	2.5	0	5	0	None
Cadmium	4.7	0	5	0	2.3	0	5	0	None
Calcium	2.7	0	6	0	1.7	0	2	0	None
Chromium	3.4	0	5	0	3.2	0	5	0	None
Cobalt	5.4	1	6	17%	1.9	0	5	0	Parent only J/UJ DL-L (Total)
Copper	2.9	0	5	0	2.1	0	5	0	None
Iron	5.0	0	2	0	2.8	0	1	0	None

Table 4-6
Serial Dilution Outliers and Corresponding Results
Qualification for Groundwater Samples

Analyte	Total				Dissolved				Action
	Avg. %D	%Ds >10%	# of Valid Results	% Valid Result >10%	Avg. %D	%Ds >10%	# of Valid Results	% Valid Result >10%	
Lead	0.2	0	2	0	1.9	0	2	0	None
Magnesium	3.4	0	4	0	3.0	0	3	0	None
Manganese	4.8	0	14	0	3.1	1	6	17	Parent only J/UJ DL-L (Dissolved)
Molybdenum	5.8	2	9	22%	2.2	0	6	0	Parent only J/UJ DL-L (Total)
Selenium	16.6	0	1	0	1.7	0	1	0	None
Nickel	5.6	2	6	33%	2.5	0	5	0	Parent only J/UJ DL-L (Total)
Potassium	NA	0	0	0	NA	0	0	0	None
Thallium	0.6	0	5	0	2.0	0	5	0	None
Silver	2.6	0	5	0	3.2	0	5	0	None
Sodium	4.0	0	1	0	NA	0	0	0	None
Vanadium	2.9	0	5	0	3.2	0	5	0	None
Zinc	14.4	2	7	29%	35	1	5	20	Parent only J/UJ DL-L (Total and Dissolved)

It was not considered necessary to extend qualification for total zinc to the remainder of the data set based on serial dilution results although more than a quarter of the results (2/7) were out. Of the two exceedances, one was very high (%D= 45.8%) and the other exceedance was marginal (%D= 11.8%). With 7 applicable serial dilution results, the high exceedance for the one sample was considered an outlier because the trend for the other six points was very low.

Approximately 20% of the total nickel serial dilution results were applicable. The nickel concentrations in samples are generally < 50 x IDL. Although a third of the applicable results were out, the exceedances were marginal (i.e., <15%) and the average %D was 5.5% which is well within the acceptance criteria of 10%. As such, data qualification was limited to the parent samples.

For all other analytes with exceedances, less than a quarter of the valid results were out. As such, qualification was limited to the parent samples.

4.3.2 Surface Water Serial Dilutions

Serial dilution tests were conducted on three surface water samples collected in October 2003, excluding the GSI data set. Table 4-7 below lists the number of applicable surface water samples that were used to perform serial dilution tests and analytes for which the evaluation was applicable. With three exceptions denoted in the table below, the percent differences (%Ds) between the original sample results and the result obtained from a five-fold diluted sample were all <10%.

Table 4-7
Serial Dilution Outliers and Corresponding Results
Qualification for Surface Water Samples

Analyte	Total				Action
	Avg. %D	%Ds >10%	# of Valid Results	% Valid Result >10%	
SURFACE WATER					
Aluminum	2.2	0	1	0	None
Antimony	NA	0	0	0	None
Arsenic	NA	0	0	0	None
Barium	NA	0	0	0	None
Beryllium	NA	0	0	0	None
Boron	NA	0	0	0	None
Cadmium	NA	0	0	0	None
Calcium	4.8	0	3	0	None
Chromium	NA	0	0	0	None
Cobalt	NA	0	0	0	None
Copper	NA	0	0	0	None
Iron	NA	0	0	0	None
Lead	NA	0	0	0	None
Magnesium	1.5	0	1	0	None
Manganese	3.7	0	2	0	None
Molybdenum	8.8	0	2	0	None
Nickel	NA	0	0	0	None
Potassium	0.4	0	0	0	None
Selenium	NA	0	0	0	None
Silver	NA	0	0	0	None
Sodium	6.6	0	1	0	None
Thallium	NA	0	0	0	None
Vanadium	NA	0	0	0	None
Zinc	32.5	1	1	100%	All total zinc results were qualified as estimated J/UJ DL-L (Total)

For the outlying zinc serial dilution results, data qualification was extended to the remainder of the data set (i.e., 12 routine surface water samples), because greater than a quarter of the results were out and the exceedance was more than marginal.

The site-specific field duplicate samples, rinsate blanks and field blanks were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrices. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

5.1 FIELD DUPLICATE SAMPLES

The field duplicate sample analysis results may be used to evaluate the overall precision of the analyses (analytical and sampling precision) and/or the sample representativeness. The following concentration dependent evaluation was used. Where both results were greater than or 5 times the Reporting Limit (RL), the Relative Percent Difference (RPD) between the results was compared to a criterion of ≤30%. If either result was ≤5x RL, the absolute difference was compared to a criteria of ≤2xRL. Similar to the laboratory duplicate evaluations, the CRDL was used as the RL for these comparisons.

Field duplicate samples were collected during this sampling event for metals, inorganics, Volatile Organic Compounds (VOCs), and explosives. Table 5-1 below summarizes the field duplicate samples collected and the frequency of field duplicate collection per analysis type, respectively.

Table 5-1
Water Samples Submitted for Field Duplicate Analyses

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Explosives
US-1-T01N-GRW US-1-T01D-GRW	Groundwater	WAT196	X	X	X		
MINE-1-T01N-GRW MINE-1-T01D-GRW	Groundwater	WAT202	X	X	X		
MW-A-T01N-GRW MW-A-T01D-GRW	Groundwater	WAT204	X	X	X		
MMW-42A-T01N-GRW MMW-42A-T01D-GRW	Groundwater	WAT206A	X	X	X		
FAGERQUISTWELL-T01N-GRW FAGERQUISTWELL-T01D-GRW	Groundwater	WAT209C	X	X	X		
MMW-30B-T01N-GRW MMW-30B-T01D-GRW	Groundwater	WAT211C	X	X	X	X	X
SPRING17-T01N-GRW SPRING17-T01D-GRW	Groundwater	WAT213C	X	X	X		
MMW-10C-T01N-GRW MMW-10C-T01D-GRW	Groundwater	WAT214A	X	X	X		
MMW-29A-T01N-GRW MMW-29A-T01D-GRW	Groundwater	WAT223A	X	X	X		
ZWERGLE-T00N-SFW ZWERGLE-T00D-SFW	Surface water	WAT187S	X	X	X		
RR-5BB-T01N-SFW RR-5BB-T01D-SFW	Surface water	WAT188S	X	X	X		

1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N."

The table below summarizes the frequency of field duplicate collection for this sampling event.

Table 5-2
Field Duplicate Collection Frequency for the October 2003 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	9	153	6
Dissolved Metals	9	153	6
Inorganics	9	153	6
VOC	1	1	100
Explosives	1	1	100
Surface Water			
Total Metals	2	12	17
Dissolved Metals	2	12	17
Inorganics	2	12	17
VOC	NA	NA	NA
SVOC	NA	NA	NA
Explosives	NA	NA	NA

As shown on the above table, the 5% (or 1 in 20) frequency specification for field duplicates was met for the groundwater and surface water samples.

5.1.1 Groundwater Field Duplicate Results

The groundwater field duplicate sample results not meeting acceptance criteria and resultant data qualification issued is summarized in Table 5-3 below.

Table 5-3
Field Duplicate Outliers and Corresponding Results Qualification for Groundwater Samples

Sample ID	Analyte	RPD or Difference	Comment	Action
Metals				
MINE-1-D01N-GRW MINE-1-D01D-GRW	Dissolved Iron	RPD=75.1%	1 out of 9	J/UJ FD-I parent and duplicate sample results
Inorganics				
MMW-42A-T01N-GRW MMW-42A-T01D-GRW	Phosphorus	AD= 2.7X RL	1 out of 9	J/UJ FD-I parent and duplicate sample results
SPRING17-T01N-GRW SPRING17-T01D-GRW	TDS	RPD= 35.2%	1 out of 9	J/UJ FD-I parent and duplicate sample results
VOC All results were within criteria				
SVOC All results were within criteria				
Explosives All results were within criteria				

Data qualification for dissolved iron, phosphorus and TDS was limited to the parent samples only because less than a quarter of the field duplicate results were outside the applicable evaluation criterion. The results were qualified as estimated with an indeterminate bias direction.

Although some results were qualified based on field duplicate agreement, the vast majority (>99%) of the field duplicate results were within limits.

5.1.2 Surface Water Field Duplicates Results

All field duplicate results were within evaluation criteria for surface water samples, therefore, no qualifications of data were necessary.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Table 5-4 lists the rinsate blanks that were collected during the October 2003 sampling event and the parameters for which they were analyzed.

Table 5-4
Rinsate Blanks Collected During the October 2003 Sampling Event

Sample ID (Date)*	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Explosives
RB01T-GRW (101903)	Groundwater	WAT211C	X	X	X	X	X
RB02T-GRW (101713)	Groundwater	WAT209C	X	X	X		
RB03T-GRW (101903)	Groundwater	WAT211C	X	X	X		
RB04T-GRW (101603)	Groundwater	WAT208C	X	X	X		
RB05T-GRW (101603)	Groundwater	WAT208C	X	X	X		
RB06T-GRW (102303)	Groundwater	WAT221C	X	X	X		
RB07T-GRW (101503)	Groundwater	WAT205C	X	X	X		
RB08T-GRW (101503)	Groundwater	WAT204C	X	X	X		
RB09T-GRW (101503)	Groundwater	WAT204C	X	X	X		
RB01T-SFW (100603)	Surface water	WAT187S	X	X	X		
RB02T-SFW (101003)	Surface water	WAT191S	X	X	X		

* The "T" in the field ID was changed to "D" for dissolved metals samples.

The QAPP required frequency of 5% for the collection of rinsate blanks was met for the October, 2003 water sampling event.

The rinsate blank detections results and the resulting data qualification issued is summarized in Tables 5-5 and 5-6. To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank

concentration as this approach was considered more appropriate than using a zero for the nondetect result which might bias the average low or biasing the average high by using the reporting limit.

5.2.1 Groundwater Rinsate Blanks

The table below summarizes the groundwater rinsate blank results and the resultant data qualification issued.

Table 5-5
Groundwater Rinsate Blank Outliers and Corresponding Results Qualification for Samples Collected during October 2003

Analyte	Sample ID*	Conc.	Ave Conc.	RL	Frequency of Detection	Range for Field Samples	Action
Metals (ug/l)							
Total Cadmium	RB03T-GRW	0.76	0.373	0.5	1 of 9	0.2-393 ug/L	All total cadmium results <1.86 ug/L were qualified as nondetect (U RB-I)
Total Iron	RB09T-GRW	398	208.2	278	1 of 9	104-255,000 ug/L	None[2]
Total Mercury	RB04T-GRW	0.16	0.062	0.1	1 of 9	0.1- 0.51	All total mercury results <0.311 ug/L were qualified as nondetect (U RB-I)
Dissolved Metals (ug/l)							
Dissolved Manganese	RB04D-GRW	12.6	7.62	12	1 of 9	10-259,000	All dissolved manganese results <38.1 ug/L were qualified as nondetect (U RB-I)
Inorganic Parameters (mg/L)							
Ammonia	RB01T-GRW	0.13	0.061	0.04	4 of 9	0.04-1.9 mg/L	All ammonia results <0.31 mg/L were qualified as nondetect (U RB-I)
	RB03T-GRW	0.17					
	RB06T-GRW	0.074					
	RB08T-GRW	0.075					
Bicarbonate and Total Alkalinity	RB01T-GRW	4.0	3.16	1.0	9 of 9	1- 546 mg/L	All total alkalinity and bicarbonate alkalinity results <15.8 mg/L were qualified as nondetect (U RB-I)
	RB02T-GRW	2.6					
	RB03T-GRW	2.9					
	RB04T-GRW	2.2					
	RB-05T-GRW	2.1					
	RB06T-GRW	5.2					
	RB07T-GRW	2.8					
	RB08T-GRW	2.9					
	RB09T-GRW	3.7					
Chloride	RB01T-GRW	2.0	0.311	0.2	1 of 9	0.52-319 mg/L	All chloride results <1.55 mg/L were qualified as nondetect (U RB-I)
Orthophosphate	RB05T-GRW	1.9	0.216	0.05	1 of 9	0.01-16.1 mg/L	All orthophosphate results <1.08 mg/L were qualified as nondetect (U RB-I)

Table 5-5
Groundwater Rinsate Blank Outliers and Corresponding Results Qualification for Samples Collected during October 2003

Analyte	Sample ID*	Conc.	Ave Conc.	RL	Frequency of Detection	Range for Field Samples	Action
Sulfate	RB06T-GRW	13.8	4.09	10	2 of 9	8.8-7,650 mg/L	All sulfate results <20.5 mg/L were qualified as nondetect (U RB-I)
	RB07T-GRW	5.3		5			
TDS	RB01T-GRW	14	10	5	4 of 9	108-11,400 mg/L	No qualifications of data were necessary since all sample results were >40.0 mg/L
	RB02T-GRW	7		5			
	RB03T-GRW	14		5			
	RB06T-GRW	10		10			
TKN	RB06T-GRW	3.5	0.496	0.2	1 of 9	0.2 to 4.6 mg/L	All TKN results < 2.47 mg/L were qualified as nondetect (U RB-I)
TSS	RB04T-GRW	0.8	0.389	0.5	3 of 9	0.5- 266 mg/L	All TSS results <1.95 mg/L were qualified as nondetect (U RB-I)
	RB05T-GRW	0.7					
	RB09T-GRW	0.5					
VOC (µg/L)							
Acetone	RB01T-GRW	2	2[1]	10	1 of 1	0.1-0.1	No qualifications of data were necessary since all sample results were >10.0 mg/L
Explosives							
All rinsate blank results were non-detect.							

ND = Nondetect MDL = Method Detection Limit RL = Reporting Limit

* The "T" in the field ID was changed to "D" for dissolved metals samples

[1]In calculating the average RB concentrations, a value of 1 was used for nondetect results, rather than the CRQL, as this value was considered more representative of the level down to which the laboratory reports positive results.

Iron was detected in 1 out of 9 RBs, however, data qualification was not issued based on the average RB concentration for the following reasons:

- If RB09T-GRW, for which the detect was obtained, was analyzed on the instrument that RB01T-GRW, RB02T-GRW, RB03T-GRW and RB06T-GRW were analyzed, the result would have been reported as nondetect at a RL of 455 mg/L.
- Retaining this detection and qualifying based on 5x the average RB concentration as is typically done would result in greater than half of the data being qualified as nondetect. Using professional judgment, this amount of qualification based on a 1 out of 9 detection rate did not seem warranted.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

5.2.2 Surface Water Rinsate Blanks

The surface water rinsate blank results and their effects regarding groundwater results qualification are provided in the following table:

Table 5-6
Surface Water Rinsate Blank Outliers and Corresponding Results
Qualification for Groundwater Samples

Analyte	Sample ID	Conc.	RL	Frequency of Detection	Average RB Concentration	Range for Field Samples	Action
Total Metals (ug/L)							
Zinc	RB01T-SFW	3.0	2.3	1 of 2	2.1	2.0 to 134	None. All sample concentrations were >10.4 units.
Inorganic Parameters (mg/L)							
Bicarbonate Alkalinity	RB01T-SFW	3.2	1.0	2 of 2	2.5	57.7 to 87.5	None. All sample concentrations were >12.5 units.
	RB02T-SFW	1.8					
Chloride	RB01T-SFW	0.52	0.20	2 of 2	0.48	1.2 to 4.1	U RB-I for all sample results ≤2.4 mg/L
	RB02T-SFW	0.22					
Nitrate	RB01T-SFW	0.54	0.20	1 of 2	0.32	0.20 to 0.43	U RB-I for all sample results ≤1.6 mg/L
Orthophosphate	RB02T-SFW	0.24	0.01	1 of 2	0.12	0.01 to 0.065	U RB-I for all sample results ≤0.61 mg/L
Total Alkalinity	RB01T-SFW	3.2	1.0	2 of 2	2.5	57.7 to 87.5	None. All sample concentrations were >12.5 units.
	RB02T-SFW	1.8					
Total Dissolved Solids	RB01T-SFW	22	10	2 of 2	14	114 to 314	None. All sample concentrations were >20 units.
	RB02T-SFW	6					
Sulfate	RB02T-SFW	5.3	5.0	1 of 2	3.9	18.1 to 130	None. All sample concentrations were >19.5 ≤ units.

ND = Nondetect MDL = Method Detection Limit RL = Reporting Limit

In calculating the average rinsate blank concentration, one half of the RL was used for nondetect results.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

5.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field blanks are only required to be collected by the project QAPP when samples are analyzed for organics.

The groundwater field blank results were all non-detect for VOC and explosive compounds. No qualifications of data were necessary.

With the exception of eight results, the October 2003 data are considered acceptable for use in meeting project objectives as qualified. Of the eight rejected results, four were metal results for groundwater samples that were rejected on the basis of extremely low matrix spike recoveries. The other four were TDS result for rinsate blank samples which were rejected on the basis of total vs. partial comparisons. Additionally, sample results were qualified as nondetect on the basis of laboratory or rinsate blank contamination. In addition, some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summaries. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

Of 784 applicable lab duplicate results, 774 satisfied the applicable evaluation criteria, for a total of 99%. Of 826 field duplicate results, 823 satisfied the applicable evaluation criteria, for a total of 99%. As such, the overall level of precision, both analytical and combined analytical and sampling demonstrated is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of Laboratory Control Samples (LCSs) and MSs.

Greater than 99% of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP. This indicates acceptable overall accuracy with respect to the analytical system. One PYX recoveries were below evaluation criteria and results for associated samples were qualified during the sample specific review.

Ninety-one percent of the MS recoveries (508 valid of 556 applicable recoveries) satisfied the applicable evaluation criteria for accuracy specified in the QAPP, indicating that acceptable overall accuracy was attained with respect to the site matrix.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements in relation to the number of measurements requested.

There were 34 samples (153 groundwater and 12 surface water) collected during the October 2003 sampling event. All results except for 4 groundwater results 4 rinsate blank results are considered valid. Consequently the completeness achieved is 99.9%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting Field Sampling Plan FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the biota samples. The close agreement between the field duplicate results, as discussed above in Section 5.1, indicates that the samples collected were adequately representative of the medium sampled.

Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. Again, the close agreement between duplicates noted in Section 5.1 indicates that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. As such, obtaining some nondetect results with elevated reporting limits was not avoidable. While it is anticipated that all data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT186S

Sampling Event: October 2003 GRW and SFW

Matrix: Solid __ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 01/15/04

Peer Reviewer: Stacey Coker

Date Completed: 01/15/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	BOD_5	COD
RB01T-BRT2	RB	545361		W	X			
RB01T-BMI	RB	545362		W	X			
RB02T-BMI	RB	545363		W	X			
RB02T-BRT2	RB	545364		W	X			
RB03T-BMI	RB	545365		W	X			
RB03T-BRT	RB	545366		W	X			
LOWERREACHOFGOATHILL-T01N-SFW	SA	544242	LOWREACHGOAT-T01N-SFW LOWREACHGOAT-T01N	W	X	X	X	X
LOWERREACHOFGOATHILL-D01N-SFW	SA	544243	LOWREACHGOAT-D01N-SFW LOWREACHGOAT-D01N	W	X			
GHGC-T01N-SFW	SA	544244		W	X	X	X	X
GHCG-D01N-SFW	SA	544245		W	X			

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory case narrative noted that due to an oversight during the ICP/MS metals analysis performed on 10/25/03, 11 samples were inadvertently analyzed between the continuing calibration check standards CCV/CCB3 and CCV/CCB4, one more than the allowed 10. This did not adversely affect the quality or usability of the data. The only implication of this was to analyze potential blank contaminations from those CCBs. Table 1.2 summarized the sample results qualified on the basis of calibration blank detections.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory log-in sheet noted that BOD_5 and COD analyses were not marked off on the COC for the field samples LOWREACHGOAT-T01N-SFW or GHGC-T01N-SFW, although the necessary volumes for the analyses were received. In addition, based on historic sampling information for surface water, the laboratory logged in the two samples for BOD_5 and COD analyses. No data qualification was necessary and completeness was not affected by this inadvertent error on the COC form.
Holding Times	No	As mentioned in the laboratory case narrative, the BOD_5 analyses for samples LOWREACHGOAT-T01N-SFW and GHGC-T01N-SFW were accomplished three days beyond the prescribed analytical holding time of 48 hours. The laboratory case narrative explained that as these analyses were not requested on the COC, the personnel were not scheduled for these analyses (note: the samples arrived that the laboratory on a Saturday). Upon recognition of this oversight, the analyses were performed. Both BOD_5 results were qualified as estimated (J). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken four days after sampling and three days beyond log-in. The pH for all samples was measured approximately two and a half days beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Aluminum, antimony, selenium, and molybdenum were detected in several of the continuing calibration blanks. None of the aluminum results were qualified on the basis of blank detection due to the fact that none of the samples were associated with the CCB which detected aluminum (CCB3). As all of the antimony results were nondetect, no qualification was necessary for any of these sample results. Table 1.2 summarizes the selenium results and one molybdenum result qualified on the basis of continuing calibration blank detection.
Matrix QC • MS/MSD • PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (A) LOWREACHGOAT-T01N-SFW • Total vs. Partial Analyses Cation/Anion Balance • Internal Standards	No	The serial dilution analysis conducted on sample LOWREACHGOAT-T01N-SFW was not applicable for 17 of the 24 metal analytes, as only seven analytes exhibited initial concentrations in excess of 50 times the IDL. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. Of the seven applicable metals, molybdenum exhibited a %D of 15.5%, accordingly resulting in the qualification of the parent samples as estimated (J) with a low bias direction. The serial dilution results for the October 2003 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and therefore did not require qualification. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5.

Review Parameter	Criteria Met?	Comments
Field QC • Field Duplicate • Rinsate Blank RB01T-BMI RB01T-BRT2 RB02T-BMI RB02T-BRT2 RB03T-BMI RB03T-BRT • Field Blank • Trip Blank		The six rinsate blanks included in this package were associated with the Fall 2003 biota (i.e. fish) sampling event. After accounting for calibration blank results, there was only one detection remaining for these six rinsate blanks. The field QC results for the October 2003 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment for the pertinent event.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD_5 (mg/L)	Cond. (µmhos/cm)	pH (std units)
LOWREACHGOAT-T01N-SFW	1.3 UJ	1080 J	5.2 J
GHGC-T01N-SFW	1.8 J	847 J	7.1 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Selenium (MS)	---	---	0.3	---	0.30	GHGC-D01N-SFW GHCG-T01N-SFW LOWREACHGOAT-D01N-SFW LOWREACHGOAT-T01N-SFW	U CCB-I
Molybdenum (MS)	1.1	---	0.3	---	0.20	RB02T-BRT2	U CCB-I

MS = ICP-MS CCBx-Continuing Calibration Blank RL = IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Field Duplicate Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	CRDL (mg/L)	FD Results		Criteria*	Qualification Code
		MINE-1-D01N-GRW	MINE-1-D01D-GRW		
Iron	100	545	1200	75.1 RPD	J FD-I

RL = Reporting Limit AD = Absolute Difference

*Criteria: RPD ≤ 30% (when both sample results >5xCRDL), or AD ≤ 2xCRDL (when one or both sample results <5xCRDL)

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT196C Sampling Event: October 2003 GRW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/15/03

Peer Reviewer: Stacey Coker Date Completed: 11/17/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
LS-1-T01N-GRW	SA	545768		W	X	X
LS-1-D01N-GRW	SA	545769		W	X	
MW-1-T01N-GRW	SA	545770		W	X	X
MW-1-D01N-GRW	SA	545771		W	X	
MW-9A-T01N-GRW	SA	545772		W	X	X
MW-9A-D01N-GRW	SA	545773		W	X	
US-3-T01N-GRW	SA	545774		W	X	X
US-3-D01N-GRW	SA	545775		W	X	
US-1-T01N-GRW	SA	545776		W	X	X
US-1-D01N-GRW	SA	545777		W	X	
US-1-T01D-GRW	FD	545778		W	X	X
US-1-D01D-GRW	FD	545779		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

As noted in the case narrative, the cyanide analysis of the continuing calibration check designated CCV4 yielded a percent recovery slightly above control criteria. Cyanide was not detected in any of the associated field samples above the reporting limit; therefore no qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The analysis for pH and conductivity were exceeded by 2 and 24 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, beryllium, copper, and molybdenum were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution LS-1-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample LS-1-T01N-GRW, pH class C, applicable for 0 out of 24 analytes. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Field QC • Field Duplicate (FD) US-1-T01D-GRW US-1-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	The field duplicate results satisfied the applicable concentration-dependent evaluation criteria and data qualification was not necessary. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH
LS-1-T01N-GRW	459 J	6.3 J
MW-1-T01N-GRW	897 J	7.0 J
MW-9A-T01N-GRW	1250 J	7.4 J
US-3-T01N-GRW	211 J	7.3 J
US-1-T01N-GRW	199 J	7.2 J
US-1-T01D-GRW	201 J	7.0 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=10			68	37.9	45.3		30.7	MW-9A-T01N-GRW, US-1-D01N-GRW	U CCB-I
Antimony (MS) DF=2	0.8	0.8	0.8	0.8			1.0	LS-1-T01N-GRW	U CCB-I
Beryllium (P) DF=1						-0.4	0.3	All samples in this SDG	UJ MB-L
Copper (P) DF=1						12.5	2.0	US-3-T01N-GRW, US-1-T01N-GRW	U CCB-I
Molybdenum (P) DF=1						1.6	1.2	MW-9A-T01N-GRW, MW-9A-D01N-GRW, US-3-T01N-GRW, US-3-D01N-GRW, US-1-T01N-GRW, US-1-D01N-GRW, US-1-T01D-GRW, US-1-D01D-GRW	U MB-I
Potassium (P) DF=1			562.8				521.7	LS-1-D01N-GRW, MW-1-T01N-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW, US-3-T01N-GRW, US-3-D01N-GRW, US-1-T01N-GRW, US-1-D01N-GRW, US-1-T01D-GRW, US-1-D01D-GRW	U CCB-I

P = ICP MS = ICP-MS MB = Method Blank CCBx - Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT200C

Sampling Event: October 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 11/18/03

Peer Reviewer: Alan Roberts

Date Completed: 11/20/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
LS-2-T01N-GRW	SA	546208		W	X	X
LS-2-D01N-GRW	SA	546209		W	X	
LS-3-T01N-GRW	SA	546210		W	X	X
LS-3-D01N-GRW	SA	546211		W	X	
MW-23-T01N-GRW	SA	546212		W	X	X
MW-23-D01N-GRW	SA	546213		W	X	
MW-22-T01N-GRW	SA	546214		W	X	X
MW-22-D01N-GRW	SA	546215		W	X	
MW-4-T01N-GRW	SA	546216		W	X	X
MW-4-D01N-GRW	SA	546217		W	X	
MW-15-T01N-GRW	SA	546218		W	X	X
MW-15-D01N-GRW	SA	546219		W	X	
MW-12-T01N-GRW	SA	546220		W	X	X
MW-12-D01N-GRW	SA	546221		W	X	
MW-11-T01N-GRW	SA	546222		W	X	X
MW-11-D01N-GRW	SA	546223		W	X	
MW-13-T01N-GRW	SA	546224		W	X	X
MW-13-D01N-GRW	SA	546225		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

As noted in the case narrative, during the mercury analysis, sample MW-4-D01N-GRW exhibited a negative interference that was not present in the replicate or in the total mercury analysis. The cause of this interference is not known. Since the replicate, the total mercury and the sample results were all non-detect at 0.10 mg/L, the interference was not considered to have affected the reported result and no qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48 hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 10 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, chromium, copper, manganese, mercury, and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS LS-2-T01N-GRW LS-2-D01N-GRW MW-4-T01N-GRW MW-4-D01N-GRW • LD LS-2-T01N-GRW LS-2-D01N-GRW MW-4-T01N-GRW MW-4-D01N-GRW	No	Matrix spike analyses were conducted on samples LS-2-T01N-GRW, LS-2-D01N-GRW, MW-4-T01N-GRW, and MW-4-D01N-GRW. Four matrix spike results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued. Laboratory duplicates (LD) analyses were conducted on samples LS-2-T01N-GRW, LS-2-D01N-GRW, MW-4-T01N-GRW, and MW-4-D01N-GRW. The copper result in sample MW-4-T01N-GRW was outside acceptance limits. The dissolved sample result of 118 µg/L was inconsistent with the total sample result (7.0 µg/L), the dissolved duplicate result (2.0 µg/L), and the historical sample data (thirty-one non-detects samples, and one sample qualified at 7.0µg/L); therefore the copper analyte in sample MW-4-T01N-GRW was rejected due to the result not being representative of the medium. Table 1.4 summarizes these results and the data qualification issued. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution LS-2-T01N-GRW LS-2-D01N-GRW MW-4-T01N-GRW MW-4-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the matrix spike samples for LS-2-T01N-GRW, LS-2-D01N-GRW, MW-4-T01N-GRW, and MW-4-D01N-GRW, pH class C. Serial dilution results for sample LS-2-T01N-GRW, LS-2-D01N-GRW, MW-4-T01N-GRW, and MW-4-D01N-GRW were applicable for 15 out of 24 metals each. For sample LS-2-D01N-GRW, the percent difference between the original result and result for the diluted sample for manganese did not satisfy the ≤10% criterion and the results for this sample were qualified as estimated. Table 1.5 summarizes these results. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. For samples LS-3-T01N/D01N-GRWand MW-4-T01N/D01N-GRW the analysis of dissolved copper exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. For the dissolved sample MW-4-D01N-GRW, the result of 118 µg/L was inconsistent with the total sample result (7.0 µg/L), the dissolved duplicate result (2.0 µg/L), and the historical sample data (thirty-one non-detects samples, and one sample qualified at 7.0µg/L); therefore the copper analyte in sample MW-4-T01N-GRW was rejected due to the result not being representative of the medium. The result for the duplicate sample analysis (2.0µg/L) was used to replace the rejected value. Also, in sample MW-23-T01N/D01N-GRW the analysis of dissolved aluminum, iron, and manganese exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.6 summarizes these results and the data qualification.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package did not include any field quality control samples. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
LS-2-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	409 J	6.3 J
L2-3-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	375 J	6.4 J
MW-23-T01N-GRW	1.1 J	0.005 UJ	0.01 UJ	444 J	7.7 J
MW-22-D01N-GRW	0.4 J	0.005 UJ	0.012 J	213 J	8.1 J
MW-4-T01N-GRW	.45 J	0.005 UJ	0.017 J	225 J	8.1 J
MW-15-T01N-GRW	---	---	---	1760 J	7.3 J
MW-12-T01N-GRW	---	---	---	272 J	8.0 J
MW-11-T01N-GRW	0.54 J	---	---	443 J	8.1 J
MW-13-T01N-GRW	0.56 J	0.005 UJ	0.011 J	616 J	8.1 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=10	27.5			51.4		21.7	LS-3-T01N-GRW, LS-3-D01N-GRW, MW-23-T01N-GRW, MW-23-D01N-GRW, MW-22-T01N-GRW, MW-4-T01N-GRW, MW-12-T01N-GRW, MW-11-T01N-GRW, MW-13-T01N-GRW, MW-13-D01N-GRW	U CCB-I
Chromium (P) DF=1					1.4	1.3	LS-3-D01N-GRW, MW-23-D01N-GRW, MW-22-T01N-GRW, MW-22-D01N-GRW, MW-4-T01N-GRW, MW-4-D01N-GRW, MW-15-T01N-GRW, MW-15-D01N-GRW, MW-12-T01N-GRW, MW-12-D01N-GRW, MW-11-T01N-GRW, MW-11-D01N-GRW, MW-13-T01N-GRW, MW-13-D01N-GRW	U MB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Copper (P) DF=1					2.4	2.0	LS-2-T01N-GRW, LS-3-T01N-GRW, MW-23-D01N-GRW, MW-22-T01N-GRW, MW-22-D01N-GRW, MW-4-T01N-GRW, MW-15-D01N-GRW, MW-12-D01N-GRW	U MB-I
Manganese (P) DF=10				2.0		1.6	MW-12-T01N-GRW, MW-13-T01N-GRW	U CCB-I
Mercury (CV) DF=1			0.1			0.1	MW-23-T01N-GRW	U CCB-I
Sodium (P) DF=10		-1585				990.9	MW-12-T01N-GRW, MW-12-D01N-GRW, MW-11-T01N-GRW, MW-11-D01N-GRW, MW-13-T01N-GRW, MW-13-D01N-GRW	UJ CCB-L

P=ICP MS = ICP-MS CV = Cold Vapor MB = Method Blank CCBx-Continuing Calibration Blank
IDL = Instrument Detection Limit RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
LS-2-T01N-GRW					
Total Organic Carbon	138	NA	75-125%	Parent sample is nondetect	No qualification
Sulfate	67	NA		NONE	J MS-L parent
MW-4-T01N-GRW					
Sulfate	69.4	NA	75-125%	NONE	J MS-L parent
Iron	126.8	98.7		NONE	J MS-H parent

NA = Not appropriate

Table 1.4
Laboratory Duplicate Results And Parent Sample Qualifications

Analyte	Sample Result	Duplicate Result	Criteria Comment	Outside Criteria	RL	Action
MW-4-D01N-GRW						
Copper (µg/l)	118	2.0	Abs. Diff. >1xRL (2.0)	Abs Diff.=116	2.0	R D-I parent, use duplicate result.

Table 1.5
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
LS-2-T01N-GRW			
Manganese	11.2	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample UJ SD-L

Table 1.6
Total vs. Dissolved Qualifications for Metals

Sample/Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
LS-3-T01N/D01N-GRW				
Copper	19.2	2.0	Absolute difference >2x RL (4.0)	UJ/J TvP-I for samples LS-3-T01N-GRW and LS-3-D01N-GRW.
MW-23-T01N/D01N-GRW				
Aluminum	580	217	Absolute difference >2x RL (434)	UJ/J TvP-I for samples MW-23-T01N-GRW and MW-23-D01N-GRW.
Iron	925	455	Absolute difference >2x RL (910)	UJ/J TvP-I for samples MW-23-T01N-GRW and MW-23-D01N-GRW.
Manganese	49.6	16	Absolute difference >2x RL (32)	UJ/J TvP-I for samples MW-23-T01N-GRW and MW-23-D01N-GRW.
MW-4-T01N/D01N-GRW				
Copper	110.8	2	Absolute difference >2x RL (4.0)	UJ/J TvP-I for sample MW-4-T01N-GRW and R TvP-I for sample MW-4-D01N-GRW. In the case of the rejected result in sample MW-4-D01N-GRW, the result from the duplicate sample analysis was used.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT201A Sampling Event: October 2003 GRW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/15/03

Peer Reviewer: Stacey Coker Date Completed: 11/17/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
US-2-T01N-GRW	SA	546308		W	X[3]	X
US-2-D01N-GRW	SA	546309		W	X[3]	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

[3] Metals results superseded by US2RA in which samples were reanalyzed by the dilution scheme for moderate pH samples

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

As noted in the case narrative, the sulfate ICB dated 10/30/03 yielded a concentration of sulfate (5.028 mg/L) marginally above reporting limit (5.0mg/L). In this particular analysis run the sample US-2-T01N-GRW was preceded by several continuing calibration blanks (CCBs), which were all within the reporting limit. In addition, the associated sample exhibited greater than ten times this concentration of sulfate, therefore no qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The analysis for pH and conductivity were exceeded by 2 and 10 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Laboratory Blank Results	No	Beryllium was detected in the method blank. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution US-2-T01N-GRW Internal Standards Total vs. Partial Analyses Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample US-2-T01N-GRW, pH class A, and was applicable for 0 out of 24 analytes. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. The reported cation/anion balances did not meet this criterion in sample US-2-T/D01N-GRW (42.55%), which agrees with the recalculated cation/anion balance. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to analysis as a class "A" groundwater sample. Therefore no qualification of these sample results was considered necessary.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package did not include any field quality control samples. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH
US-2-T01N-GRW	346 J	6.7 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=10					-0.4		US-2-T01N-GRW, US-2-D01N-GRW	UJ MB-L

P = ICP MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT202C

Sampling Event: October 2003 GRW and SFW

Matrix: Solid ___ Water X Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 01/05/04

Peer Reviewer: Stacey Coker

Date Completed: 01/11/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
MINE-1-T01N-GRW	SA	546310	W	X	X
MINE-1-D01N-GRW	SA	546311	W	X	
MINE-1-T01D-GRW	FD	546312	W	X	X
MINE-1-D01D-GRW	FD	546313	W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	All nitrate, nitrite, and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 10 days after sampling and eight days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J).

Review Parameter	Criteria Met?	Comments
		Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. However, several results were qualified as nondetect on the basis of continuing calibration blank (CCB) and method blank (MB), as summarized in Table 1.2.
Matrix QC • MS/MSD • PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MINE-1-T01N-GRWL • Total vs. Partial Analyses Cation/Anion Balance • Internal Standards	No	The serial dilution analysis conducted on sample MINE-1-T01N-GRW was not applicable for 13 of the 24 metal analytes, as 11 analytes exhibited initial concentrations in excess of 50 times the IDL. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. Table 1.3 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The serial dilution results for the October 2003 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and therefore did not require qualification. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. The internal standard recovery of ^{89}Y was high for the ICPMS analyses of samples MINE1-T01N-GRW and MINE1-T01D-GRW. Accordingly, the molybdenum for these samples, as verified by the run-logs, were reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate MINE-1-T01N/T01D-GRW MINE-1-D01N/D01D-GRW • Rinsate Blank • Field Blank • Trip Blank		Field duplicates were assessed for overall sampling precision relative to the analyte and representativeness to the medium. The iron results for samples MINE-1-D01N-GRW and MINE-1-D01D-GRW were qualified as estimated due to field duplicate disagreement. Table 1.4 summarizes the results and resultant qualifications. The field QC results for the October 2003 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
MINE-1-T01N-GRW	0.45 J	0.0050 UJ	0.010 UJ	2850 J	7.2 J
MINE-1-T01D-GRW	0.45 J	0.0050 UJ	0.010 UJ	2850 J	7.3 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	0.9	0.8	---	---	---	1.0	MINE-1-T01N-GRW	U CCB-I
Chromium (P)	-3.1	---	-6.3	---	-1.696	1.1	MINE-1-D01D-GRW MINE-1-D01N-GRW MINE-1-T01D-GRW MINE-1-T01N-GRW	J MB,CCB-L
Mercury (CV)	---	---	---	0.1	---	0.1	MINE-1-D01D-GRW	U CCB-I

MS = ICP-MS P = ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilutions Resulting in
Parent Sample Qualifications

Analyte	%D	Qualification Codes
MINE-1-T01N-GRW		
Beryllium	18.4	J DL-L
Cobalt	13.9	
Molybdenum	12.0	
Nickel	12.4	

Table 1.4
Field Duplicate Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	CRDL (mg/L)	FD Results		Criteria*	Qualification Code
		MINE-1-D01N-GRW	MINE-1-D01D-GRW		
Iron	100	545	1200	75.1 RPD	J FD-I

RL = Reporting Limit AD = Absolute Difference

*Criteria: RPD ≤ 30% (when both sample results >5xCRDL), or AD ≤ 2xCRDL (when one or both sample results <5xCRDL)

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT203C

Sampling Event: October 2003 GRW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 11/18/03

Peer Reviewer: Stacey Coker

Date Completed: 11/20/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MW-CH-T01N-GRW	SA	546474		W	X	X
MW-CH-D01N-GRW	SA	546475		W	X	
MW-10-T01N-GRW	SA	546476		W	X	X
MW-10-D01N-GRW	SA	546477		W	X	
MW-24-T01N-GRW	SA	546478		W	X	X
MW-24-D01N-GRW	SA	546479		W	X	
MW-28-T01N-GRW	SA	546480		W	X	X
MW-28-D01N-GRW	SA	546481		W	X	
EW-5C-T01N-GRW	SA	546482		W	X	X
EW-5C-D01N-GRW	SA	546483		W	X	
MW-7C-T01N-GRW	SA	546484		W	X	X
MW-7C-D01N-GRW	SA	546485		W	X	
MW-7A-T01N-GRW	SA	546486		W	X	X
MW-7A-D01N-GRW	SA	546487		W	X	
MW-25-T01N-GRW	SA	546488		W	X	X
MW-25-D01N-GRW	SA	546489		W	X	
MW-2-T01N-GRW	SA	546490		W	X	X
MW-2-D01N-GRW	SA	546491		W	X	
MW-B-T01N-GRW	SA	546492		W	X	X
MW-B-D01N-GRW	SA	546493		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

As noted in the case narrative, the sulfate analysis of the final continuing calibration blank (CCB) yielded the presence of sulfate at the reporting limit, however, all of the associated samples yielded sulfate concentrations greater than ten times the reporting limit. No qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48 hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 11 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Beryllium and copper were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MW-CH-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample MW-CH-T01N-GRW, pH class C, applicable for 0 out of 24 analytes. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For sample MW-25-T01N/D01N-GRW the analysis of dissolved copper exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.3 summarizes these results and the data qualification. All of the alkalinity results for sample MW-2-T01N-GRW were qualified as estimated (J/UJ TvP-I) because the sum of the alkalinity forms was greater than the total alkalinity results.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package did not include any field quality control samples. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
MW-CH-T01N-GRW	0.44 J	0.005 UJ	0.015 J	472 J	7.5 J
MW-10-T01N-GRW	0.47 J	0.005 UJ	0.024 J	212 J	7.8 J
MW-24-T01N-GRW	1.4 J	0.005 UJ	0.013 J	336J	7.6 J
MW-28-D01N-GRW	0.25 J	0.005 UJ	0.01 UJ	1300 J	7.3 J
EW-5C-T01N-GRW	---	---	---	1690 J	7.2 J
MW-7C-T01N-GRW	0.31 J	0.005 UJ	0.033 J	1600 J	7.2 J
MW-7A-T01N-GRW	0.28 J	0.005 UJ	0.034 J	1670 J	7.2 J
MW-25-T01N-GRW	---	---	---	266 J	8.0 J
MW-2-T01N-GRW	---	---	---	777 J	9.0 J
MW-B-T01N-GRW	---	0.005 UJ	---	1590 J	7.5 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=1	0.4	0.6	0.4	0.4		0.3	MW-24-T01N-GRW, MW-24-D01N-GRW, MW-28-T01N-GRW, EW-5C-T01N-GRW, MW-7A-T01N-GRW, MW-25-T01N-GRW, MW-B-D01N-GRW	U CCB-I
Copper (P) DF=1				-2.8		2.0	MW-2-T01N-GRW, MW-2-D01N-GRW, MW-B-T01N-GRW, MW-B-D01N-GRW	UJ CCB-L

P=ICP MS = ICP-MS MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Dissolved Qualifications for Metals

Sample/ Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
MW-25-T01N/D01N-GRW				
Copper	5.3	2.0	Absolute difference <2x RL (4.0)	UJ/J TvP-I for samples MW-25-T01N-GRW and MW-25-D01N-GRW.

Note: The instrument detection limit (IDL) is used as the reporting limit (RL) for total vs. partial evaluations.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT204C

Sampling Event: October 2003 Groundwater

Matrix: Solid ___Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 11/20/03

Peer Reviewer: Stacey Coker

Date Completed: 11/17/03

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MW-29-T01N-GRW	SA	546530		W	X	X
MW-29-D01N-GRW	SA	546531		W	X	
RB09T-GRW	RB	546532		W	X	X
RB09D-GRW	RB	546533		W	X	
EW-6-T01N-GRW	SA	546534		W	X	X
EW-6-D01N-GRW	SA	546535		W	X	
EW-5D-T01N-GRW	SA	546536		W	X	X
EW-5D-D01N-GRW	SA	546537		W	X	
MW-A-T01N-GRW	SA	546538		W	X	X
MW-A-D01N-GRW	SA	546539		W	X	
MW-A-T01D-GRW	FD	546540		W	X	X
MW-A-D01D-GRW	FD	546541		W	X	
MW-26-T01N-GRW	SA	546542		W	X	X
MW-26-D01N-GRW	SA	546543		W	X	
EW-1-T01N-GRW	SA	546544		W	X	X
EW-1-D01N-GRW	SA	546545		W	X	
MW-21-T01N-GRW	SA	546546		W	X	X
MW-21-D01N-GRW	SA	546547		W	X	
RB08T-GRW	RB	546548		W	X	X
RB08D-GRW	RB	546549		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

As noted in the case narrative, during the sulfate analysis from 10/30/03, the initial calibration blank (ICB) exhibited a sulfate concentration that was at the reporting limit. However, the results from the run were reported because all samples concentrations of sulfate were more than 10x the amount found in the ICB, with the exception of samples RB08T-GRW and RB09T-GRW, which were surrounded by acceptable (i.e., nondetect) continuing calibration blanks (CCBs). For these samples, no qualification was necessary.

Also noted in the case narrative, during the mercury analysis from 11/5/03, the initial calibration verification (ICV) standard exhibited a percent recovery (86.3%) that was slightly below control criteria (90-110%). The analytical results from this analytical sequence are formally reported. The ICV was not considered to have affected the reported results and all the sample results were analyzed between acceptable (i.e., nondetect) CCBs; therefore no qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 1-2 and 11-12 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, iron, molybdenum, and sulfate were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MW-29-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample MW-29-T01N-GRW, pH class C, applicable for 2 out of 24 analytes. The serial dilution results for these two samples were within acceptance limits and data qualification was not necessary. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For samples RB08T/D-GRWand RB09T/D-GRW, the cation/anion balances were outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary. In calculating the charge balances, it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit for samples RB08T/D-GRW and RB09T/D-GRW as summarized in Table 1.3. Because the ratio of the calculated TDS (based mostly on detection limit for nondetect results) was significantly lower than the measured and reported TDS, the TDS result was qualified as unusable.
Field QC • Field Duplicate (FD) MW-A-T01D-GRW MW-A-D01D-GRW • Rinsate Blank (RB) RB08T-GRW RB08D-GRW	No	The field duplicate results satisfied the applicable concentration-dependent evaluation criteria and data qualification was not necessary. There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.4. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
RB09T-GRW RB09D-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)		
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
MW-29-T01N-GRW	0.21 J	0.005 UJ	0.022 J	1450 J	7.3 J
RB09T-GRW	0.20 UJ	0.005 UJ	0.01 UJ	0.0 J	7.3 J
EW-6-T01N-GRW	---	---	---	1370 J	7.3 J
EW-5D-T01N-GRW	---	---	---	1760 J	7.3 J
MW-A-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1010 J	7.3 J
MW-A-T01D-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1010 J	7.2 J
MW-26-T01N-GRW	1.7 J	---	---	538 J	7.2 J
EW-1-T01N-GRW	---	---	---	678 J	7.6 J
MW-21-T01N-GRW	9.1 J	---	---	1030 J	7.6 J
RB08T-GRW	0.2 UJ	---	---	5.3 J	7.1 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=10	28.3	38.2	43.2	37.9		22.1	MW-26-T01N-GRW, MW-21-T01N-GRW	U CCB-I
Antimony (MS) DF=2	0.9	0.8	0.7	0.8		0.5	MW-29-T01N-GRW	U CCB-I
Iron (P) DF=10				33.5		27.8	MW-21-T01N-GRW	U CCB-I
Molybdenum (P) DF=1	1.2		1.7			1.1	EW-6-T01N-GRW, EW-6-D01N-GRW	U CCB-I
							EW-5D-T01N-GRW, EW-5D-D01N-GRW	U CCB, MB-I
Analyte					**MB (mg/l)**	**RL (mg/l)**	**Samples Qualified**	**Qualification Code**
Sulfate DF=1, 10, 20, or 100					5.0	5.0	MW-29-T01N-GRW, RB09T-GRW, EW-6-T01N-GRW, EW-5D-T01N-GRW, MW-26-T01N-GRW, EW-1-T01N-GRW, MW-21-T01N-GRW, RB08T-GRW	U MB-I

P = ICP MS = ICP-MS MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total Dissolved Solids Summary

Sample	TDS Measured (mg/L)	TDS Calculated (mg/L)	Ratio of Calculated vs. Measured	Ration Acceptance Range	Qualification Code
RB08T/D-GRW	134	21	0.16	0.5 to 1.5	R TvP-H
RB09T/D-GRW	186	23	0.12		

Table 1.4
Rinsate Blank Detections

	Samples	
Analytes	RB09T-GRW	RB08T-GRW
TSS (mg/l)	0.50	---
Bicarbonate Alkalinity (mg/l)	3.7	2.9
Total Alkalinity (mg/l)	3.7	2.9
Iron (µg/l)	398	---

--- = Sample was not analyzed for these parameters; therefore no qualification was necessary.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT205C

Sampling Event: October 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 11/20/03

Peer Reviewer: Stacey Coker

Date Completed: 11/24/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MW-14-T01N-GRW	SA	546576		W	X	X
MW-14-D01N-GRW	SA	546577		W	X	
RB07T-GRW	RB	546578		W	X	X
RB07D-GRW	RB	546579		W	X	
MW-27-T01N-GRW	SA	546580		W	X	X
MW-27-D01N-GRW	SA	546581		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD=Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For all samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N. The analysis for pH and conductivity were exceeded by 2 and 20 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Laboratory Blank Results	No	Antimony and chromium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MW-14-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample MW-14-T01N-GRW, pH class C, applicable for 0 out of 24 analytes. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For samples RB04T/D-GRW, the cation/anion balance was outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary. In calculating the charge balances, it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit for sample RB07T-GRW as summarized in Table 1.3. Because the ratio of the calculated TDS (based mostly on detection limit for nondetect results) was significantly lower than the measured and reported TDS, the TDS result was qualified as unusable.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB07T-GRW RB07D-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.4. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Conductivity (umhos/cm)	pH
MW-14-T01N-GRW	0.55 J	823 J	7.4 J
RB07T-GRW	0.20 UJ	0.0 J	7.4 J
MW-27-T01N-GRW	0.66 J	334 J	7.7 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS) DF=2	1.1	1.0	1.1	0.5	MW-14-T01N-GRW	U CCB, MB-I
Chromium (P) DF=1			1.161	1.1	MW-14-T01N-GRW, MW-14-D01N-GRW, MW-27-D01N-GRW	U MB-I

P = ICP MS = ICP-MS MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total Dissolved Solids Summary

Sample	TDS Measured (mg/L)	TDS Calculated (mg/L)	Ratio of Calculated vs. Measured	Ratio Acceptance Range	Qualification Code
RB07T/D-GRW	102	22	0.21	0.5 to 1.5	R TvP-H

Table 1.4
Rinsate Blank Detections

	Sample	
Analytes	RB07T-GRW	RB07D-GRW
Bicarbonate Alkalinity (mg/l)	2.8	---
Total Alkalinity (mg/l)	2.8	---

-- -= Sample was not analyzed for these parameters; therefore no qualification was necessary.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT206A

Sampling Event: October 2003 GRW and SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Karen Kronoveter

Date Completed: 01/07/04

Peer Reviewer: Stacey Coker

Date Completed: 01/12/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
P-5B-T01N-GRW	SA	546841		W	X	X
P-5B-D01N-GRW	SA	546842		W	X	
P-5C-T01N-GRW	SA	546843		W	X	X
P-5C-D01N-GRW	SA	546844		W	X	
MMW-42A-T01N-GRW	SA	546845		W	X	X
MMW-42A-D01N-GRW	SA	546846		W	X	
MMW-42A-T01D-GRW	FD	546847		W	X	X
MMW-42A-D01D-GRW	FD	546848		W	X	
P-2-T01N-GRW	SA	546849		W	X	X
P-2-D01N-GRW	SA	546850		W	X	
P-3-T01N-GRW	SA	546851		W	X	X
P-3-D01N-GRW	SA	546852		W	X	
COLUMBINENO1-T01N-GRW	SA	546853	COLUMBINENO1-T01N-G	W	X	X
COLUMBINENO1-D01N-GRW	SA	546854	COLUMBINENO1-D01N-G	W	X	
COLUMBINENO2-T01N-GRW	SA	546855	COLUMBINENO2-T01N-G	W	X	X
COLUMBINENO2-D01N-GRW	SA	546856	COLUMBINENO2-D01N-G	W	X	
P-4B-T01N-GRW	SA	546857		W	X	X
P-4B-D01N-GRW	SA	546858		W	X	
MMW-47A-T01N-GRW	SA	546859		W	X	X
MMW-47A-D01N-GRW	SA	546884		W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. As the samples were collected under the RI/FS, the data package included results for permit-required parameters and additional RI/FS parameters. This data review summary is limited to the metals and inorganic analyses.

Case Narrative Summary: Issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below, or in the case narrative summary to follow.

The laboratory case narrative noted the replicate analysis of sample P-2-T01N-GRW resulted in a Relative Percent Difference (RPD) for Phosphorus that was in excess of control criteria. Upon review of the summary for MS, LD it was determined that no qualification was necessary on the basis of laboratory duplicate results due to the fact that the wrong evaluation criterion had been applied for the analyte in question, (neither result was greater than 5x the RL, therefore the absolute difference between the two results was compared to an evaluation criteria of ≤1x RL).

The laboratory case narrative noted that a reduced TDS ratio value (<0.50) was obtained for sample P-3-T/D01N-GRW. . The laboratory reanalyzed this sample outside of holding time resulting in an acceptable TDS ratio (1.37). Accordingly, the measured TDS result for the reanalysis was reported and qualified as estimated (J) on the basis of holding time.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	According to the laboratory log-in sheet, the chain of custody erroneously listed sample COLUMBINENO2-T01N-GRW as COLUMBINENO2-T02N-GRW. The sample was logged in according to the field ID on the sample bottle labels. No data qualification was necessary and completeness was not affected by this inadvertent error on the COC form.
Holding Times	No	Multiple nitrate, nitrite, and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 11 days after sampling and 9 days beyond log-in. The pH for all samples was measured approximately eight hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). As mentioned previously, the TDS result for sample P-3-T01N-GRW was qualified as estimated (J), as the reported analysis result was performed two days beyond the prescribed analytical holding time of seven days. Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD P-2-T01N-GRWMS P-2-D01N-GRWMS • PDS MMW-17A-T01N-GRWA MMW-17A-D01N-GRWA • LD P-2-T10N-GRWREP P-2-D01N-GRWREP	No	Results for various analytes were outside the 75-125% recovery acceptance range for each of the two matrix spike samples, suggesting potential biases in the reporting of results. Table 1.3 summarizes the analytes recovered outside the acceptance range of 75-125%, along with the qualifications assigned to the parent sample. The analyte concentrations of aluminum and manganese were greater than 4x the spike concentrations and consequently were considered inappropriate for assessing accuracy for sample specific matrix effects. There was an instance in which the reporting limit for iron was increased due to dilution factors but the spike analyte amount added was not adjusted accordingly. As noted in Table 1.3, it was therefore considered inappropriate for assessing accuracy for sample specific matrix affects for iron.

Review Parameter	Criteria Met?	Comments
		Post digestion spikes were performed on the metal analytes that did not meet the specified criterion for the initial matrix spike recoveries. All post digestion spike recoveries for these analytes were within acceptance limits and did not therefore require qualification on this basis. Laboratory duplicates were assessed to evaluate the precision of the laboratory analyses. Multiple results for samples P-2-T01N-GRW and P-2-D01N-GRW were qualified as estimated due to laboratory duplicate disagreement. Table 1.4 summarizes the results and resultant qualifications. In instances when either sample or duplicate result was nondetect, the RPD was recalculated using the RL instead of zero. If the RPD recalculated was still in excess of 20%, the sample results were qualified as estimated. The matrix quality control results for the October 2003 Groundwater and Surface Water sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (A) P-2-T01N-GRW P-2-D01N-GRW • Total vs. Partial Analyses Cation/Anion Balance • Internal Standards	No	The serial dilution analyses conducted on matrix spike samples P-2-T01N-GRW and P-2-D01N-GRW were not applicable for 23 of the 24 metal analytes, as only manganese exhibited an initial concentration in excess of 50 times the IDL, run at a hundred-fold dilution. The percent deviation between the original result and its 5-fold dilution for this analyte was compared to an evaluation criterion of ±10%. As neither %D for molybdenum for either sample was in excess of 10%, no data qualification was necessary on the basis of serial dilution. The serial dilution results for the October 2003 Groundwater and Surface Water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exception of samples P-2-T01N-GRW and P-2-D01N-GRW. The percent difference of 27.27 was verified independently. The laboratory case narrative notes that the results were compared with historical data. The elevated cation reporting limits associated with dilutions for class "A" samples may be the cause of the elevated percent differences, as nondetects are reported at the reporting limit. No qualifications were issued on the basis of cation/anion balances, as the results were not an appropriate measure of accuracy. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. The internal standard recoveries of ^{89}Y were high for the ICPMS analyses of the majority of the samples in this delivery group. As molybdenum results for the affected samples were reported from the trace ICP, as verified by the run-logs, no qualification of data was necessary on the basis of poor internal standard recoveries. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate MMW-42A-T01N/T01D-GRW MMW-42A-D01N/D01D-GRW • Rinsate Blank • Field Blank • Trip Blank		Field duplicates were assessed for overall precision of the analyte and representativeness to the medium. The phosphorus results for samples MMW-42A-T01N-GRW and MMW-42A-T01D-GRW were qualified as estimated due to field duplicate disagreement. As neither phosphorus result was greater than 5x the RL, the absolute difference between the two values was compared to an evaluative criteria of 2x the RL, thereby resulting in qualification of both results as estimated (J/UJ) with an indeterminate bias direction assigned. The field QC results for the October 2003 Groundwater and Surface Water sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)	TDS (mg/L)
P-5B-T01N-GRW	---	---	---	1270 J	4.8 J	---
P-5C-T01N-GRW	---	---	---	1450 J	4.8 J	---
MMW-42A-T01N-GRW	---	---	---	2360 J	3.5 J	---
MMW-42-T01D-GRW	---	---	---	2390 J	3.5 J	---
P-2-T01N-GRW	2.0 J	0.0050 UJ	0.010 J	1030 J	4.8 J	---
P-3-T01N-GRW	1.4 J	---	0.010 J	813 J	4.9 J	743 J
COLUMBINENO1-T01N-GRW	2.3 J	0.0050 UJ	0.010 UJ	1300 J	5.2 J	---
COLUMBINENO2-T01N-GRW	1.5 J	0.0050 UJ	0.010 UJ	901 J	5.4 J	---
P-4B-T01N-GRW	---	---	---	1280 J	4.8 J	---
MMW-47A-T01N-GRW	---	---	---	941 J	5.2 J	---

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (mg/L)	Samples Qualified	Qualification Code
Beryllium (P)	0.6	-0.7	--- 0.6*	-1.2	-2.0	0.360	0.3	All samples with the **exception of:** MMW-42A-T01D-GRW MMW-42A-T01N-GRW	J CCB-L UJ MB,CCB-L UJ CCB-L U CCB-1
Cadmium (P)	2.5	2.1	0.7	---	---	3.308	0.7	COLUMBINENO1-D01N-GRW COLUMBINENO1-T01N-GRW COLUMBINENO2-T01N-GRW MMW-42A-D01D-GRW MMW-42A-D01N-GRW MMW-42A-T01D-GRW MMW-42A-T01N-GRW P-2-T01N-GRW P-3-D01N-GRW P-4B-D01N-GRW P-5B-D01N-GRW P-5B-T01N-GRW P-5C-D01N-GRW P-5C-T01N-GRW	U MB,CCB-I
Molybdenum (P)	-1.9 3.0*	-1.3 1.2*	-2.8 1.8*	-2.4 1.5*	-3.1 ---*	-2.136 ---*	1.2 1.1*	All samples with the **exception of:** P-2-D01N-GRW	UJ MC, CCB-L U CCB-I
Selenium (MS)	---	---	---	---	---	5.308	0.3	All samples qualified	U MB-I
Nickel (P)	---	---	---	3.1	---	---	2.40	MMW-42A-D01D-GRW MMW-42A-D01N-GRW MMW-42A-T01D-GRW MMW-42A-T01N-GRW P-2-D01N-GRW P-2-T01N-GRW P-5B-D01N-GRW P-5B-T01N-GRW P-5C-D01N-GRW P-5C-T01N-GRW	U CCB-I

P = ICP MS = ICPMS CCBx-Continuing Calibration Blank RL = IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

*Only samples P-2-T01N-GRW and P-2-D01N-GRW are associated with these calibration events.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Qualification Codes
P-2-T01N-GRW				
Total Alkalinity	40.6	N/A	75-125%	NQ[1]
Ammonia-Nitrogen	70.1			J MS-L
Arsenic	160.5	108.4		NQ[6]
Chromium	53.8	105.3		J MS-L
Copper	56.7	97.2		J MS-L
Cyanide	33.8	106.7		UJ MS-L
Iron	-195.0	108.4		NQ[2]
P-2-D01N-GRW				
Cadmium	28.4	107.4	75-125%	R MS-L[3]
Chromium	137.2	105.4		NQ[4]
Cobalt	131.7	104.3		NQ[5]
Copper	53.4	100.1		UJ MS-L
Nickel	138.8	105.5		NQ (Nondetect)
Iron	0.0	101.1		NQ[2]

NQ[1]: No Qualification was issued, due to the acidic nature of the sample (pH 4.8) neutralizing the spike

NQ[2]: No Qualification was issued, as the spike amount added was below the reporting limit

R MS-L[3]: These three analyte results were rejected on the basis of matrix spike recovery below 30% and nondetect results.

NQ[4]: When the matrix spike recovery was recalculated using the reporting limit for the nondetect value as opposed to zero, a matrix spike recovery of 109.7% was attained. No qualification was assigned, as the chromium result was nondetect in association with a high matrix recovery; additionally, no high bias was suggested by the recalculation.

NQ[5]: When the matrix spike recovery was recalculated using the reporting limit for the nondetect value as opposed to zero, a matrix spike recovery of 102.7% was attained. No qualification was assigned, as the cobalt result was nondetect in association with a high matrix recovery; additionally, no high bias was suggested by the recalculation.

NQ[6]: When the matrix spike recovery was recalculated using the reporting limit for the nondetect value as opposed to zero, a matrix spike recovery of 109.3% was attained. No qualification was assigned, as the arsenic result was nondetect in association with a high matrix recovery; additionally, no high bias was suggested by the recalculation.

Table 1.4
Laboratory Duplicate Results and Parent Sample Qualifications

Analyte	Result (µg/L)	Duplicate (µg/L)	RL* (µg/L)	Criterion	Qualification
P-2-T01N-GRW					
Ammonia-Nitrogen	0.0099 (mg/L)	0.16 (mg/L)	0.040 (mg/L)	AD > 1xRL	J D-I

*CRDL used in place of the RL for metal analytes AD = Absolute Difference (RL used for nondetect results)

Criteria: RPD ≤20% (when both sample results >5xCRDL), AD ≤1xRL (when one or both sample results <5xCRDL)

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT207A

Sampling Event: October 2003 GRW and SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 01/06/04

Peer Reviewer: Stacey Coker

Date Completed: 01/12/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
MMW-31A-T01N-GRW	SA	546885	W	X	X
MMW-31A-D01N-GRW	SA	546886	W	X	
MMW-17A-T01N-GRW	SA	546887	W	X	X
MMW-17A-D01N-GRW	SA	546888	W	X	
MMW-17B-T01N-GRW	SA	546889	W	X	X
MMW-17B-D01N-GRW	SA	546890	W	X	
MMW-48A-T01N-GRW	SA	546891	W	X	X
MMW-48A-D01N-GRW	SA	546892	W	X	
MMW-45A-T01N-GRW	SA	546893	W	X	X
MMW-45A-D01N-GRW	SA	546894	W	X	
P-1-T01N-GRW	SA	546895	W	X	X
P-1-D01N-GRW	SA	546896	W	X	
MMW-45B-T01N-GRW	SA	546897	W	X	X
MMW-45B-D01N-GRW	SA	546898	W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory case narrative notes the laboratory duplicate associated with sample MMW-17A-T01N-GRW reported an RPD of 46% for total phosphorus. Due to the fact that neither sample result was greater than five times the reporting limit, the appropriate evaluative criterion is comparing the absolute difference between the two concentrations to 1x the RL. As such, no qualification on the basis of laboratory duplicate disagreement was needed.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Multiple nitrate, nitrite, and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 17-18 days after sampling and 15-16 days beyond log-in. The pH for all samples was measured approximately eight hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD MMW-17A-T01N-GRWMS MMW-17A-D01N-GRWMS • PDS MMW-17A-T01N-GRWA MMW-17A-D01N-GRWA • LD MMW-17A-T01N-GRWREP MMW-17A-D01N-GRWREP	No	Results for various analytes were outside the 75-125% recovery acceptance range for each of the two matrix spike samples, suggesting potential biases in the reporting of results. Table 1.3 summarizes the analytes recovered outside the acceptance range of 75-125%, along with the qualifications assigned to the parent sample. There were several instances in which the reporting limits for various metal analytes were increased due to dilution factors but the spike analyte amounts added were not adjusted accordingly. As noted in Table 1.3, it was therefore considered inappropriate for assessing accuracy for sample specific matrix affects for cadmium and iron. Post digestion spikes were performed on the metal analytes that did not meet the specified criterion for the initial matrix spike recoveries. All post digestion spike recoveries for these analytes were within acceptance limits and did not therefore require qualification on this basis. The matrix quality control results for the October 2003 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (A) MMW-17A-T01N-GRW MMW-17A-D01N-GRW • Total vs. Partial Analyses Cation/Anion Balance • Internal Standards	No	The serial dilution analyses conducted on matrix spike samples MMW-17A-T01N-GRW and MMW-17A-D01N-GRW were not applicable for 23 of the 24 metal analytes, as only molybdenum exhibited an initial concentration in excess of 50 times the IDL, run at a ten-fold dilution. The percent deviation between the original result and its 5-fold dilution for this analyte was compared to an evaluation criterion of ±10%. As neither %D for molybdenum for either sample was in excess of 10%, no data qualification was necessary on the basis of serial dilution. The serial dilution results for the October 2003 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. For sample MMW-31A-T01N/D01N-SFW the analysis of dissolved calcium, 262000 µg/L, and zinc, 9550 µg/L, exceeded that of the total analyses, 160000 µg/L and 5810 µg/L, respectively, beyond variation expected due to the accuracy limitations of the method. Likewise, for sample MMW-45A-T01N/D01N-GRW the analysis of dissolved zinc, 6080µg/L, exceeded that of the total analysis, 4110 µg/L, beyond variation expected due to the accuracy limitations of the method. For these two samples, the total vs. partial results not meeting criteria were qualified as estimated UJ/J TvP-I. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5.

Review Parameter	Criteria Met?	Comments
		The internal standard recoveries of 89Y were high for the ICPMS analyses of samples MMW-31A-T01N-GRW, MMW-31A-D01N-GRW, MMW-45A-T01N-GRW, MMW-45A-D01N-GRW, P-1-T01N-GRW, P-1-D01N-GRW, and MMW-45B-T01N-GRW. Accordingly, the molybdenum and beryllium results for these samples, as verified by the run-logs, were reported from the trace ICP. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	NA	No field QC samples were analyzed with this data package. The field QC results for the October 2003 Groundwater sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (μmhos/cm)	pH (std units)
MMW-31A-T01N-GRW	---	---	---	1760 J	4.4 J
MMW-17A-T01N-GRW	---	---	---	660 J	4.7 J
MMW-17B-T01N-GRW	---	---	---	659 J	4.7 J
MMW-48A-T01N-GRW	0.20 UJ	---	0.086 J	3110 J	5.5 J
MMW-45A-T01N-GRW	0.32 J	---	---	1340 J	3.9 J
P-1-T01N-GRW	2.2 J	0.0050 UJ	0.010 UJ	1210 J	4.7 J
MMW-45B-T01N-GRW	0.20 UJ	---	0.038 J	2240 J	4.0 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Chromium (P)	-6.0	-6.4	-6.1	-6.1	-6.117	2.30	All samples were qualified	UJ MB, CCB-L
Nickel (P)	-6.2	-6.1	-5.3	-5.1	-6.174	4.50		
Zinc (P)	---	---	---	---	2.126	1.90	MMW-17A-D01N-GRW MMW-17A-T01N-GRW MMW-17B-D01N-GRW MMW-17B-T01N-GRW	U MB-I

P = ICP CCBx-Continuing Calibration Blank RL = IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Qualification Codes
MMW-17A-T01N-GRW				
Total Alkalinity	61.8	N/A	75-125%	NQ[1]
Cadmium	0.0	98.7		NQ[2]
Chromium	0.0	96.0		R MS-L[3]
Iron	0.0	94.9		NQ[1]
Nickel	48.7	97.3		UJ MS-L
MMW-17A-D01N-GRW				
Arsenic	135.4[3]	115.7	75-125%	NQ[3]
Cadmium	0.0	103.4		NQ[2]
Chromium	0.0	100.6		R MS-L[4]
Iron	0.0	101.2		NQ[1]
Nickel	0.0	101.6		R MS-L[4]
Thallium	129.3	115.6		NQ[5]

NQ[1]: No Qualification was issued, due to the acidic nature of the sample (pH 4.8) neutralizing the spike.

NQ[2]: No Qualification was issued, as the spike amount added was below the reporting limit.

NQ[3]: When the matrix spike recovery was recalculated using the reporting limit for the nondetect value as opposed to zero, a matrix spike recovery of 84.1% was attained. No qualification was assigned, as the arsenic result was nondetect in association with a high matrix recovery; additionally, no high bias was suggested by the recalculation.

R MS-L[4]: These three analyte results were rejected on the basis of matrix spike recovery below 30% and nondetect results.

NQ[5]: When the matrix spike recovery was recalculated using the reporting limit for the nondetect value as opposed to zero, a matrix spike recovery of 124% was attained. No qualification was assigned, as the thallium result was nondetect in association with a high matrix recovery; additionally, no high bias was suggested by the recalculation.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT208C

Sampling Event: October 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 11/25/03

Peer Reviewer: Stacey Coker

Date Completed: 11/26/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganics
RB01T-SED[3]	RB	545699		W	X	X
CUBE1-END-QABLK[4]	SA	545700		W		X
CUBE2-BEGIN-QABLK[4]	SA	545701		W		X
RB04T-GRW	RB	546899		W	X	
RB04D-GRW	RB	546900		W	X	X
RB05T-GRW	RB	546901		W	X	
RB05D-GRW	RB	546902		W	X	X
EW-4-T01N-GRW	SA	546903		W	X	
EW-4-D01N-GRW	SA	546904		W	X	X
MW-17-T01N-GRW	SA	546905		W	X	
MW-17-D01N-GRW	SA	546906		W	X	X
EW-5B-T01N-GRW	SA	546907		W	X	
EW-5B-D01N-GRW	SA	546908		W	X	X
MW-20-T01N-GRW	SA	546909		W	X	
MW-20-D01N-GRW	SA	546910		W	X	X
EW-2-T01N-GRW	SA	546911		W	X	
EW-2-D01N-GRW	SA	546912		W	X	X
EW-3-T01N-GRW	SA	546913		W	X	
EW-3-D01N-GRW	SA	546914		W	X	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

[3]This sample was analyzed for the list of inorganic analytes associated with soil and sediment samples..

[4]These samples were analyzed for ammonia only.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

As noted in the case narrative, during the sulfate analysis from 10/30/03, the initial calibration blank (ICB) exhibited a sulfate concentration that was at the reporting limit. However, the results from the run were reported because all sample concentrations of sulfate were more than 10x the amount found in the ICB, with the exception of samples RB05T-GRW, which was re-analyzed and the results for the reanalysis were reported. For these samples, no qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	On the sample vials, BOD and Cyanide analyses were erroneously requested for sample RB01T-SED. However, the COC request forms did not request these analyses. It was confirmed that these tests were not required for the water portion of RB01T-SED as these are not RI/FS inorganic parameters associated with the solid matrices.
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 20 days, respectively, with the exception of sample RB01T-SED which was exceeded by 11 and 14 days. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Iron and molybdenum were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS EW-5B-T01N-GRW EW-5B-D01N-GRW • LD EW-5B-T01N-GRW EW-5B-D01N-GRW	No	Matrix spike (MS) analyses were conducted on samples EW-5B-T01N-GRW and EW-5B-D01N-GRW. Four MS results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution EW-5B-T01N-GRW EW-5B-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the post digestion spike samples for EW-5B-T01N-GRW and EW-5B-D01N-GRW, pH class C. Serial dilution results for sample EW-5B-T01N-GRW was applicable for 16 out of 24 metals, and EW-5B-D01N-GRW was applicable for 17 out of 24 metals each. For sample EW-5B-T01N-GRW, the percent difference between the original result and result for the diluted sample for nickel did not satisfy the ≤10% criterion and the results for this sample were qualified as estimated. Table 1.4 summarizes these results. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. For sample RB05T-GRW the analysis of orthophosphate exceeded that of the total phosphorus analysis beyond variation expected due to the accuracy limitations of the method. Table 1.5 summarizes these results and the data qualification. For samples RB04T/D-GRWand RB05T/D-GRW, the cation/anion balances were outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary. In calculating the charge balances, it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit for samples RB04T/D-GRW and RB05T/D-GRW as summarized in Table 1.6. Because the ratio of the calculated TDS (based mostly on detection limit for

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		nondetect results) was significantly lower than the measured and reported TDS, the TDS result for RB04T-GRW was qualified as unusable.
Field QC Field Duplicate (FD) Rinsate Blank (RB) RB01T-SED RB04T-GRW RB04D-GRW RB05T-GRW RB05D-GRW Field Blank (FB) Trip Blank (TB) Other (e.g., splits)	No	There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.7. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
RB01T-SED	0.2 UJ	NA	NA	0.04 J	6.5 J
RB04T-GRW	0.2 UJ	---	---	2.9 J	4.8 J
RB05T-GRW	0.2 UJ	0.005 UJ	1.9 J	1.6 J	5.4 J
EW-4-T01N-GRW	0.27 J	---	0.041 J	1120 J	7.1 J
MW-17-T01N-GRW	0.29 J	0.005 UJ	0.01 UJ	600 J	7.4 J
EW-5B-T01N-GRW	0.2 UJ	0.005 UJ	0.1 J	1520 J	7.3 J
MW-20-T01N-GRW	2.1 J	0.005 UJ	0.024 J	412 J	7.3 J
EW-2-T01N-GRW	0.61 J	---	0.011 J	432 J	7.8 J
EW-3-T01N-GRW	0.31 J	0.005 UJ	0.014 J	1320 J	7.3 J

--- = Samples were within hold time; therefore no qualification was necessary.

NA = Not Analyzed

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Iron (P) DF=10	36.8			32.9		27.8	RB04T-GRW, EW-3-T01N-GRW	U CCB-I
Molybdenum (P) DF=1	1.1	2.7				1.1	RB01T-SED	U CCB-I

P = ICP MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS% R	PDS %R	Criteria	Comment	Action
EW-5B-T01N-GRW					
Ammonia	74.4	NA	75-125%	NONE	J MS-L parent
Sulfate	69.2	NA		NONE	J MS-L parent
Silver	100.1	63.0		Matrix spike within control limits.	No qualification
EW-5B-D01N-GRW					
Silver	102.7	66.0	75-125%	Matrix spike within control limits.	No qualification

NA = Not appropriate

Table 1.4
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
EW-5B-T01N-GRW			
Nickel	11.1	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%.	Qualify parent sample J DL-L

Note: Percent differences that rounded to 10% were not considered outside of the acceptance limit and data qualification was not issued.

Table 1.5
Total vs. Partial Qualifications for Inorganincs

Sample/Analytes	Absolute Difference	RL	Evaluation Criteria	Action
RB05T-GRW				
Orthophosphate vs. Phosphorus	0.37	0.01	Evaluation criteria is met when the absolute difference is less than 2x RL (0.02)	J/UJ TVP-I for sample RB05T-GRW.

Table 1.6
Total Dissolved Solids Summary

Sample	TDS Measured (mg/L)	TDS Calculated (mg/L)	Ratio of Calculated vs. Measured	Ration Acceptance Range	Qualification Code
RB04T/D-GRW	84	21	0.25	0.5 to 1.5	R TvP-H
RB05T/D-GRW	10 U	23	2.29		UJ TVP-L

Table 1.7
Rinsate Blank Detections

	Samples			
Analytes	RB01T-SED	RB04T-GRW	RB04D-GRW	RB05T-GRW
TSS (mg/l)	---	0.8	---	0.7
Bicarbonate Alkalinity (mg/l)	---	2.2	---	2.1
Total Alkalinity (mg/l)	---	2.2	---	2.1
Ammonia (mg/l)	0.06	---	---	---
Mercury (µg/l)	---	0.16	---	---
Manganese (µg/l)	---	---	12.6	---

--- = Sample was either nondetect or not analyzed for these parameters; therefore no qualification was necessary.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT209C

Sampling Event: October 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 01/07/04

Peer Reviewer: Stacey Coker

Date Completed: 01/12/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
COMPANYCABINSWELL-T01N-GRW	SA	546918	COMPCABWELL-T01N-GRW COMPCABWELL-T01N-G	W	X	
COMPANYCABINSWELL-D01N-GRW	SA	546919	COMPCABWELL-D01N-GRW COMPCABWELL-D01N-G	W	X	
MMW-42B-T01N-GRW	SA	546920		W	X	X
MMW-42B-D01N-GRW	SA	546921		W	X	
FAGERQUISTWELL-T01N-GRW	SA	546922	FAGERWELL-T01N-GRW	W	X	X
FAGERQUISTWELL-D01N-GRW	SA	546923	FAGERWELL-D01N-GRW	W	X	
FAGERQUISTWELL-T01D-GRW	FD	546924	FAGERWELL-T01D-GRW	W	X	X
FAGERQUISTWELL-D01D-GRW	FD	546925	FAGERWELL-D01D-GRW	W	X	
LABWELL-T01N-GRW	SA	546926		W	X	X
LABWELL-D01N-GRW	SA	546927		W	X	
MMW-8A-T01N-GRW	SA	546928		W	X	X
MMW-8A-D01N-GRW	SA	546929		W	X	
MMW-3-T01N-GRW	SA	546930		W	X	X
MMW-3-D01N-GRW	SA	546931		W	X	
RB02T-GRW	RB	546932		W	X	X
RB02D-GRW	RB	546933		W	X	
MMW-2-T01N-GRW	SA	546934		W	X	X
MMW-2-D01N-GRW	SA	546935		W	X	
MMW-31B-T01N-GRW	SA	546936		W	X	X
MMW-31B-D01N-GRW	SA	546937		W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. As the samples were collected under the RI/FS, the data package included results for permit-required parameters and additional RI/FS parameters. This data review summary is limited to the metals and inorganic analyses.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are noted below.

The laboratory case narrative noted the replicate analysis of sample LABWELL-T01N-GRW resulted in a Relative Percent Difference (RPD) for Ammonia that was in excess of control criteria. Upon review of the summary for MS, LD it was determined that no qualification was necessary on the basis of laboratory duplicate results due to the fact that the RPD was not the appropriate evaluation criterion. Both Ammonia results were ≤5x RL and the difference between the results was <1x RL. As such, the laboratory duplicate results are considered to be indicative of acceptable analytical precision.

The laboratory case narrative noted that during the Sulfate analytical sequence from 10/31/03, the associated calibration blanks yielded Sulfate concentrations that exceeded the reporting limit. The samples with concentrations greater than 10 times the blank concentration were reported from this analytical sequence. This did not affect the quality or the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The sample preservation document noted that upon log-in, all samples (total fraction) with the exception of COMPCABWELL-T01N-GRW for cyanide analysis were received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect results for these samples were qualified as estimated (UJ), with an indeterminate bias direction.
Holding Times	No	Multiple nitrate, nitrite, and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 24-25 days after sampling and 22-23 days beyond log-in. The pH for all samples was measured approximately eight hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD MMW-17A-T01N-GRWMS MMW-17A-D01N-GRWMS • PDS MMW-17A-T01N-GRWA MMW-17A-D01N-GRWA • LD MMW-17A-T01N-GRWREP MMW-17A-D01N-GRWREP	No	All metal matrix spike results for the two samples were recovered within the acceptance range of 75-125%, therefore no qualification was necessary on the basis of matrix spike recoveries for metal results. The matrix spike recovery for sulfate in sample LABWELL-1-T01N-GRW was 49.6%, thereby indicating a potential low bias in the reporting of sulfate results. Accordingly, the sulfate result in this parent sample was qualified as estimated (J), with a low bias assigned. The matrix quality control results for the October 2003 Groundwater sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (C) LABWELL-T01N-GRWMSL LABWELL-D01N-GRWMSL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses conducted on matrix spike samples LABWELL-T01N-GRW and LABWELL-D01N-GRW were not applicable for five of the 24 metal analytes, as 19 analytes in each sample exhibited initial concentration in excess of 50 times the IDL. The percent deviation between the original result and its 5-fold dilution for this analyte was compared to an evaluation criterion of ±10%. Table 1.3 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The serial dilution results for the October 2003 Groundwater sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment. The results for multiple analytes were qualified as (J/UJ) on the basis of total versus partial disagreement and assigned a qualifier code of "TvP" with an indeterminate bias direction. If both analyte concentrations per sample couple (dissolved/total) were greater than 5x the RL (adjusted for dilution), the Relative Percent Difference (RPD) was compared to an evaluation criterion of ≤30%. When one or both of the analyte concentrations for the sample couple were not greater than 5x the RL (adjusted for dilution), the absolute difference between the two results was compared to an evaluation criterion of 2x the RL (adjusted for dilution). Table 1.4 summarizes the results qualified along with the concentrations reported. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exception of sample RB02T/D. The percent difference of 47.10 for this sample pair was verified independently. The concentrations were low enough that the reporting limits controlled the calculations. The balance was therefore not an appropriate measure of accuracy. No qualification of data in this delivery group was considered necessary on the basis of cation/anion imbalances. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5, with the exception of sample pairs FAGERQUISTWELL-T01N/D01N-GRW and RB02T/D-GRW, which reported ratios of 0.44 and 0.39, respectively. The laboratory case narrative noted the laboratory was in the process of investigating these elevated results, and in so doing, re-analyzing the samples. It is noted that the re-analyses will be provided as an addendum to this data submittal. For the time being, the TDS results for the referenced samples and the field duplicate for FAGERQUISTWELL-T01N-GRW (FAGERQUISTWELL-T01D-GRW) were qualified as estimated (J), with a high bias. The internal standard recoveries of ^{89}Y were high for the ICPMS analyses of samples MMW-2-T01N-GRW, MMW-2-D01N-GRW, MMW-31B-T01N-GRW, and MMW-31B-D01N-GRW. Accordingly, the molybdenum results for these samples, as verified by the run-logs, were reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate FAGERWELL-T01N/T01D-GRW RB02T/02D-GRW • Rinsate Blank RB02T/02D-GRW • Field Blank • Trip Blank		Field duplicates were assessed for overall precision of the analyte and representativeness to the medium. All results for these field duplicate pairs satisfied the evaluation criteria in the QAPP. Therefore, no data qualification was necessary on the basis of field duplicate disagreement. The field QC results for the October 2003 Groundwater sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
COMPANYCABINSWELL-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	321 J	7.5 J
MMW-42B-T01N-GRW	0.20 UJ	---	---	2750 J	7.0 J
FAGERQUISTWELL-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	198 J	7.3 J
FAGERQUISTWELL-T01D-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	159 J	7.4 J
LABWELL	0.23 J	0.0050 UJ	0.010 UJ	299 J	7.2 J
MMW-8A-T01N-GRW	0.20 UJ	---	---	2400 J	7.0 J
MMW-3-T01N-GRW	0.20 UJ	---	---	2270 J	7.0 J
RB02T-GRW	---	---	---	53.4 J	7.4 J
MMW-2-T01N-GRW	0.20 UJ	---	---	2440 J	6.3 J
MMW-31B-T01N-GRW	0.20 UJ	---	---	2720 J	6.6 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Boron (P)	---	---	---	----	---	9.824	6.3	LABWELL-D01N-GRW LABWELL-T01N-GRW	U MB-I
Mercury (CV)	-0.1	-0.1	---	---	---	---	0.1	COMPANYCABINSWELL-D01N-GRW COMPANYCABINSWELL-T01N-GRW FAGERQUISTWELL-D01D-GRW FAGERQUISTWELL-D01N-GRW FAGERQUISTWELL-T01D-GRW FAGERQUISTWELL-T01N-GRW LABWELL-T01N-GRW MMW-31B-T01N-GRW MMW-42B-D01N-GRW MMW-42B-T01N-GRW MMW-8A-D01N-GRW MMW-8A-T01N-GRW	UJ CCB-L
Molybdenum (P)	1.1* 1.2	--- 1.9	--- ---	-1.7* 1.5	--- ---	--- ---	1.1	COMPANYCABINSWELL-D01N-GRW* COMPANYCABINSWELL-T01N-GRW* FAGERQUISTWELL-D01D-GRW* FAGERQUISTWELL-D01N-GRW* FAGERQUISTWELL-T01D-GRW* FAGERQUISTWELL-T01N-GRW* LABWELL-D01N-GRW LABWELL-T01N-GRW MMW-2-D01N-GRW* MMW-2-T01N-GRW* MMW-31B-D01N-GRW* MMW-31B-T01N-GRW* MMW-3-D01N-GRW* MMW-3-T01N-GRW* MMW-8A-D01N-GRW* MMW-8A-T01N-GRW*	U CCB-I U MB,CCB-I UJ CCB-L J CCB-L
Potassium (P)	-414.1* 359.2	813.4* 696.4	--- 1613.0	1411.0* 926.5	1765.0*	-421.90* 357.2	318.0	COMPANYCABINSWELL-D01N-GRW* COMPANYCABINSWELL-T01N-GRW* FAGERQUISTWELL-D01D-GRW* FAGERQUISTWELL-D01N-GRW* FAGERQUISTWELL-T01D-GRW* FAGERQUISTWELL-T01N-GRW* LABWELL-D01N-GRW LABWELL-T01N-GRW MMW-31B-D01N-GRW* MMW-31B-T01N-GRW* MMW-8A-D01N-GRW* MMW-8A-T01N-GRW* RB02D-GRW* RB0T2-GRW*	UJ MB,CCB-L U CCB-I U MB,CCB-I

P = ICP P = ICP MS = ICPMS CV = Cold Vapor CCBx-Continuing Calibration Blank RL=IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Results for several of the above analytes were reported from two different dates (11/26/03) or (12/01/03) from ICAP 4.

Those reported from 11/27/03 are designated with a *, the others were reported from the 12/01/03 run.

Table 1.3
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
LABWELL-T01N-GRW		
Selenium	16.6	UJ DL-L
Zinc	45.8	J DL-L
LABWELL-D01N-GRW		
Zinc	10.4	J DL-L

Table 1.4
Total vs. Partial Qualifications

Sample	Analyte	Dissolved (µg/L)	Total (µg/L)	Adjusted RL (µg/L)	Evaluation Criterion	Qualification Code
MMW-2-T01N/D01N-GRW	Arsenic	3.4	1.8	0.4	AD ≤2x RL	J TvP-I
MMW-3-T01N/D01N-GRW	Cobalt	12.4	9.0	2.9		
MMW-42B-T01N/D01N-GRW	Cobalt	12.6	2.9 (U)	2.9		

AD = Absolute Difference (RL used for nondetect result to calculate AD)

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT210S

Sampling Event: October 2003 GRW and SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 01/08/04

Peer Reviewer: Stacey Coker

Date Completed: 01/12/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses			
				Metals	Inorganics	BOD	COD
RR-14-T01N-SFW	SA	547267	W	X	X	X	X
RR-14-D01N-SFW	SA	547268	W	X			
RR-16-T01N-SFW	SA	547269	W	X	X	X	X
RR-16-D01N-SFW	SA	547270	W	X			
RR-11C-T01N-SFW	SA	547271	W	X	X	X	X
RR-11C-D01N-SFW	SA	547272	W	X			
RR-11A1-T01N-SFW	SA	547273	W	X	X	X	X
RR-11A1-D01N-SFW	SA	547274	W	X			
RR-10-T01N-SFW	SA	547275	W	X	X	X	X
RR-10-D01N-SFW	SA	547276	W	X			
RR-10A1-T01N-SFW	SA	547277	W	X	X	X	X
RR-10A1-D01N-SFW	SA	547278	W	X			
RR-7-T01N-SFW	SA	547279	W	X	X	X	X
RR-7-D01N-SFW	SA	547280	W	X			
RR-13-T01N-SFW	SA	547281	W	X	X	X	X
RR-13-D01N-SFW	SA	547282	W	X			
RR-12-T01N-SFW	SA	547486	W	X	X	X	X
RR-12-D01N-SFW	SA	547487	W	X			

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are summarized in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Multiple nitrate, nitrite, and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). As mentioned in the laboratory case narrative, the sulfate analysis for sample RR-12-T01N-SFW was accomplished one day beyond the prescribed analytical holding time of 28 days due to a sample management error on the side of the lab. This result was accordingly qualified as estimated (J). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 19 days after sampling and 17 days beyond log-in. The pH for all samples was measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. However, several results were qualified as nondetect on the basis of continuing calibration blank (CCB) and method blank (MB), as summarized in Table 1.2.
Matrix QC • MS/MSD • PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) RR-14-T01N-SFW • Total vs. Partial Analyses Cation/Anion Balance • Internal Standards	No	The serial dilution analysis conducted on sample RR-14-T01N-SFW was not applicable for 19 of the 24 metal analytes, as five analytes exhibited initial concentrations in excess of 50 times the IDL. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. Table 1. 3 summarizes the one serial dilution result outside the evaluation criterion of ±10% and the resultant data qualification issued. The serial dilution results for the October 2003 sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment. The laboratory case narrative noted that cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion and therefore did not require qualification. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5.
Field QC ▪ Field Duplicate ▪ Rinsate Blank ▪ Field Blank ▪ Trip Blank	NA	No field QC samples were analyzed with this data package. The field QC results for the October 2003 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	All instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	

Review Parameter	Criteria Met?	Comments
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	BOD_5 (mg/L)	Cond. (µmhos/cm)	pH (std units)	Sulfate (mg/L)
RR-14-T01N-SFW	0.35 J	0.0050 UJ	0.010 UJ	1.4 UJ	303 J	7.5 J	---
RR-16-T01N-SFW	0.38 J	0.0050 UJ	0.010 UJ	1.4 UJ	319 J	7.7 J	---
RR-11C-T01N-SFW	0.35 J	0.0050 UJ	0.010 UJ	1.4 UJ	297 J	7.5 J	---
RR-11A1-T01N-SFW	0.29 J	0.0050 UJ	0.010 UJ	1.4 UJ	230 J	8.0 J	---
RR-10-T01N-SFW	---	---	---	1.4 UJ	251 J	8.1 J	---
RR-10A1-T01N-SFW	---	---	---	1.4 UJ	235 J	8.1 J	---
RR-7-T01N-SFW	---	---	---	1.4 UJ	246 J	8.2 J	---
RR-13-T01N-SFW	0.37 J	0.0050 UJ	0.010 UJ	1.4 UJ	303 J	7.8 J	---
RR-12-T01N-SFW	0.37 J	0.0050 UJ	0.010 UJ	1.4 UJ	320 J	7.4 J	95.0 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	1.3	1.2	1.2	1.3	---	0.558	0.50	RR-14-T01N-SFW	U MB,CCB-I
Boron (P)	10.2	8.6	9.0	---	---	---	6.3	RR-10A1-T01N-SFW	U CCB-I
Nickel (MS)	---	---	---	---	---	-1.687	1.6	RR-10A1-D01N-SFW RR-10A1-T01N-SFW RR-10-D01N-SFW RR-10-T01N-SFW RR-11A1-D01N-SFW RR-11A1-T01N-SFW	J MB-L
Mercury (CV)	-0.1	-0.1	---	---	-0.1	---	0.1	All samples with the exception of: RR-12-D01N-SFW RR-12-T01N-SFW	UJ CCB-L
Potassium (P)	---	-433.9	-1380.0	-1416.0	---	---	318.0	All samples with the exception of: RR-10A1-T01N-SFW	J CCB-L UJ CCB-L

MS = ICP-MS P = ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL = IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
RR-14-T01N-SFW		
Zinc	32.5	J DL-L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT211C

Sampling Event: October 2003 GRW/SFW

Matrix: Solid ____ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Ansley Watson

Date Completed: 12/29/03

Peer Reviewer: Stacey Coker

Date Completed: 12/31/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	VOCs	Explosives
MMW-30B-T01N-GRW	SA	547390	3BT01NGRW or 0BT01NGRW	W	X	X	X	X
MMW-30B-D01N-GRW	SA	547391		W	X			
RB01T-GRW	RB	547392		W	X	X	X	X
RB01D-GRW	RB	547393		W	X			
FB01T-GRW	FB	547394		W			X	X
MMW-30B-T01D-GRW	FD	547395	30BT01DGRW or MW30BT01DGRW	W	X	X	X	X
MMW-30B-D01D-GRW	FD	547396		W	X			
TB-300-GRW	TB	547397		W			X	
MMW-44B-T01N-GRW	SA	547398		W	X	X		
MMW-44B-D01N-GRW	SA	547399		W	X			
MMW-13-T01N-GRW	SA	547400		W	X	X		
MMW-13-D01N-GRW	SA	547401		W	X			
RB03T-GRW	RB	547402		W	X	X		
RB03D-GRW	RB	547403		W	X			

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FB = Field Blank RB = Rinsate Blank TB = Trip Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

As noted in the case narrative, during the inorganic data review process the cation/anion balances for the samples in this sample delivery group (SDG) were evaluated to check the correctness of the analyses. All of the samples exhibited ion balance percent differences and ratios of calculated versus measured total dissolved solids (TDS) that were within the validation limits except RB01T-GRW and RB03T-GRW.

This sample was re-analyzed for TDS beyond the prescribed holding time. Table 1.1 summarizes the holding time qualifications. The TDS results from the second analyses of these samples were generally lower, and the ratios were within guidelines. Data from the second TDS analyses have been reported in this SDG, and are further discussed in the cation/anion balance section below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample FB01T-GRW was inadvertently sent to the laboratory with extra volume for explosives; however, the COC was not marked for this analysis. The laboratory was contacted and the correction was made so that this sample was logged in for explosives analysis.
Holding Times	No	For a few samples, the 48 hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 22 days, respectively. Due to a sample management error, the 14-day sampled to extraction hold time was exceeded by four days for explosives samples. However, due to the stable nature of the explosives samples and the 40-day hold time requirement from extraction to analysis being met, it was not considered necessary to qualify these samples. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony, beryllium, boron, chromium, cobalt, copper, lead, molybdenum, nickel, potassium, zinc, and 1,2,4-trichlorobenzene were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS MMW-30B-T01N-GRW MMW-30B-D01N-GRW • LD MMW-30B-T01N-GRW MMW-30B-D01N-GRW	No	Matrix spike analyses were conducted on samples MMW-30B-T01N-GRWand MMW-30B-D01N-GRW. Six matrix spike results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued. Laboratory duplicates (LD) analyses were conducted on samples MMW-30B-T01N-GRWand MMW-30B-D01N-GRW. The TDS result in sample MMW-30B-T01N-GRW was outside acceptance limits. Table 1.4 summarizes these results and the data qualification issued. The matrix quality control results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-30B-T01N-GRW MMW-30B-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recovery for the volatile organic compounds (VOC) analyses was high in MMW-30B-T01N-GRW. The recovery of the surrogate toluene-d8 was 111%. This recovery is slightly above the acceptance range of 88%-110%, suggesting a potential high bias in the associated sample results. Because the surrogate recovery is greater than the acceptance limit, all detected VOC results for sample MMW-30B-T01N-GRW were qualified as estimated ("J"). Nondetects results are considered to be acceptable for use without qualification. The surrogate recovery for the explosive analysis was high in samples MMW-30B-T01N-GRW and MMW-30B-T01D-GRW. The surrogate recoveries of 1,2-dinitrobenzene were both 139%. This recovery is outside the acceptance range of 85%-116%, suggesting a potential high bias in the associated sample results. Because the surrogate recovery is greater than the acceptance limit, all detected explosive results for samples MMW-30B-T01N-GRW and MMW-30B-T01D-GRW were qualified as estimated ("J"). Nondetects results are considered to be acceptable for use without qualification. The serial dilution analyses were conducted on the matrix spike samples for MMW-30B-T01N-GRWand MMW-30B-D01N-GRW, pH class C. Serial dilution results for sample MMW-30B-T01N-GRWand MMW-30B-D01N-GRW were applicable for 16 out of 24 metals each. The serial dilution results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		For samples MMW-30B-T01N-GRWand MMW-30B-T01D-GRW the analysis of orthophosphate exceeded that of the total phosphorus analysis beyond variation expected due to the accuracy limitations of the method. Table 1.5 summarizes these results and the data qualification. For samples RB01T/D-GRW and RB03T/D-GRW, the cation/anion balances were outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary based on the ion balance. Additionally, for both rinsate blank samples, the ratio of calculated TDS to measured TDS was outside of acceptance limits. The laboratory reanalyzed both samples for TDS and the reanalysis results were reported.
Field QC • Field Duplicate (FD) MMW-30B-T01D-GRW MMW-30B-D01D-GRW • Rinsate Blank (RB) RB01T-GRW/RB01D-GRW RB03T-GRW/RB03D-GRW • Field Blank (FB) FB01T-GRW • Trip Blank (TB) TB-300-GRW • Other (e.g., splits)	No	The field duplicate results satisfied the applicable concentration-dependent evaluation criteria and data qualification was not necessary. There were a few detections in the rinsate blank (RB). These are summarized in Table 1.6. The field quality control results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. Initially, the fluoride reporting limit was incorrect due to a laboratory error in which the wrong reporting limit was imported into the reporting program. As such, the base fluoride reporting limit was 1.0 mg/L rather than 0.1 mg/L. The laboratory issued revised data sheets. Consequently, any on instrument concentrations between 0.1 mg/L and 1.0 mg/L (uncorrected for dilution) that were initially reported as nondetects were reported as detected concentrations on the revised data sheets.
Package Completeness	Yes	The laboratory submitted revised inorganics data sheets and electronic data to reflect the TDS reanalyses and corrected fluoride reporting limit. The revised data sheets were collated into the package, making the package complete.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results: As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package. • VOCs: Detected organic analytes with concentrations between the MDL and the RL were qualified as estimated (J). A qualifier code of "SQL-I" was assigned to reflect the greater uncertainty in quantitative values below the RL.

Review Parameter	Criteria Met?	Comments
Laboratory-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	No	The laboratory control sample (LCS) for explosives analysis, yielded a slightly low percent recovery (62%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time, therefore the default range of 70-130% was applied by the laboratory. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J), with a low bias direction.
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Conductivity (umhos/cm)	pH
MMW-30B-T01N-GRW	0.20 UJ	0.016 J	0.18 J	---	2180 J	7.3 J
RB01T-GRW	0.20 UJ	0.005 UJ	0.01 UJ	14 J	10.6 J	7.4 J
MMW-30B-T01D-GRW	0.2 UJ	0.013 J	0.15 J	---	2100 J	7.2 J
MMW-44B-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	---	2640 J	6.9 J
MMW-13-T01N-GRW	---	---	---	---	1630 J	7.2 J
RB03T-GRW	0.2 UJ	0.005 UJ	0.01 UJ	14 J	0.05 J	7.3 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS) DF=2 12/1			1.0	1.1	1.0		0.5	MMW-30B-T01N-GRW, MMW-30B-D01N-GRW	U CCB-I
Beryllium (P) DF=1 11/30			-0.7	-0.8			0.4	RB01T-GRW, RB01D-GRW, MMW-30B-T01D-GRW, MMW-30B-D01D-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, MMW-13-T01N-GRW, MMW-13-D01N-GRW, RB03T-GRW, RB03D-GRW	UJ/J CCB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Boron (P) DF=1 11/30		7.2	9.2	11.5			6.3	MMW-44B-D01N-GRW, MMW-13-T01N-GRW, MMW-13-D01N-GRW	U CCB-I
Chromium (P) DF=1 11/30		-7.1	-7.6	-7.1		-7.239	1.1	RB01T-GRW, RB01D-GRW, MMW-30B-T01D-GRW, MMW-30B-D01D-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, MMW-13-T01N-GRW, MMW-13-D01N-GRW, RB03T-GRW, RB03D-GRW	UJ/J CCB, MB-L
Cobalt (P) DF=1 11/30		-7.5	-8.5	-7.6		-7.499	2.9	RB01T-GRW, RB01D-GRW, MMW-30B-T01D-GRW, MMW-30B-D01D-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, MMW-13-T01N-GRW, MMW-13-D01N-GRW, RB03T-GRW, RB03D-GRW	UJ/J CCB, MB-L
Copper (P) DF=1 11/30				2.5			2.2	RB03T-GRW	U CCB-I
Lead (MS) DF=2 11/26		0.3	0.4				0.2	MMW-13-T01N-GRW	U CCB-I
Molybdenum (MS) DF=2 11/26	0.4					0.45	0.2	MMW-30B-T01D-GRW, MMW-30B-D01D-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW	U CCB, MB-I
Nickel (P) DF=1 11/30		-6.2	-6.8	-5.5		-5.738	2.4	RB01T-GRW, RB01D-GRW, MMW-30B-T01D-GRW, MMW-30B-D01D-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, MMW-13-T01N-GRW, MMW-13-D01N-GRW, RB03T-GRW, RB03D-GRW	UJ/J CCB, MB-L
Potassium (P) DF=1 11/30		1066	2763	3397			318	RB01T-GRW, RB01D-GRW, MMW-30B-T01D-GRW, MMW-30B-D01D-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, MMW-13-T01N-GRW, MMW-13-D01N-GRW, RB03T-GRW, RB03D-GRW	U CCB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Zinc (P) DF=10 11/30						7.046	1.9	RB01T-GRW, MMW-30B-D01D-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, MMW-13-T01N-GRW, MMW-13-D01N-GRW	U MB-I
Zinc (P) DF=10 12/1						4.086	1.9	MMW-30B-T01N-GRW, MMW-30B-D01N-GRW	U MB-I
1,2,4-Trichloro benzene DF=1						2	10	MMW-30B-T01N-GRW	U MB-I

P=ICP MS = ICP-MS CV = Cold Vapor MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
MMW-30B-T01N-GRW					
Ammonia	70.8	NA	75-125%	NONE	J MS-L parent
Nitrite as N	9.5	NA		NONE	J MS-L parent
TOC	60.0	NA		NONE	J MS-L parent
Selenium	38.4	96.2		NONE	J MS-L parent
Cyanide	47.0	76.8		NONE	J MS-L parent
MMW-30B-D01N-GRW					
Selenium	38.0	96.5	75-125%	NONE	J MS-L parent

NA = Not appropriate

Table 1.4
Laboratory Duplicate Results and Parent Sample Qualifications

Analyte	Sample Result	Duplicate Result	Criteria Comment	Outside Criteria	RL	Action
MMW-30B-T01N-GRW						
TDS (mg/l)	1890	892	RPD=+/- 20%	RPD=72	10.0	J D-I parent, use duplicate result.

Table 1.5
Total vs. Dissolved Qualifications

Sample/Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
MMW-30B-T01N-GRW				
Orthophosphate vs. Phosphate	0.138	0.01	Absolute difference >2x RL (0.02)	J TvP-I for sample MMW-30B-T01N-GRW.
MMW-30B-T01D-GRW				
Orthophosphate vs. Phosphate	0.106	0.01	Absolute difference >2x RL (0.02)	J TvP-I for sample MMW-30B-T01D-GRW.

Table 1.6
Rinsate Blank Detections

Analytes	RB01T-GRW	RB03T-GRW
TDS (mg/l)	14	14
Chloride (mg/l)	2.0	---
Bicarbonate Alkalinity (mg/l)	4.0	2.9
Total Alkalinity (mg/l)	4.0	2.9
Ammonia (mg/l)	0.13	0.17
Cadmium (ug/l)	---	0.76

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT212A Sampling Event: October 2003 GRW/SFW

Matrix: Solid ____ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 12/18/03

Peer Reviewer: Stacey Coker Date Completed: 1/14/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganics
MMW-21-T01N-GRW	SA	547460		W	X	X
MMW-21 -D01N-GRW	SA	547461		W	X	
MMW-7-T01N-GRW	SA	547462		W	X	X
MMW-7-D01N-GRW	SA	547463		W	X	
MMW-22-T01N-GRW	SA	547464		W	X	X
MMW-22-D01N-GRW	SA	547465		W	X	
MMW-30A-T01N-GRW	SA	547466		W	X	X
MMW-30A-D01N-GRW	SA	547467		W	X	
MMW-27A-T01N-GRW	SA	547468		W	X	X
MMW-27A-D01N-GRW	SA	547469		W	X	
MMW-44A-T01N-GRW	SA	547470		W	X	X
MMW-44A-D01N-GRW	SA	547471		W	X	
MMW-36B-T01N-GRW	SA	547472		W	X	X
MMW-36B-D01N-GRW	SA	547473		W	X	
MMW-8B-T01N-GRW	SA	547474		W	X	X
MMW-8B-D01N-GRW	SA	547475		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

The metals analysis of the initial calibration verification standard associated with analytical sequence from 12/3/03 yielded a percent recovery of 112.5% for iron that slightly exceeded the upper control limit. Iron was detected in samples MMW-36B-T01N-GRW and MMW-36B-D01N-GRW; however these two samples were bracketed by continuing calibration verifications that were within control limits (CCV1=98.9% and CCV2=97.8%). As such, qualification was not necessary. Iron was not detected in any of the other associated field samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The original total dissolved solids (TDS) analysis of samples MMW-22-T01N-GRW, MMW-44A-T01N-GRW, and MMW-36B-T01N-GRW which were performed within holding time, yielded a net weight after drying that greatly exceeded the upper limit of the method. These samples were re-analyzed outside of holding time using a smaller volume yielding results comparable to the original analysis. The results from the re-analysis were formally presented in this package, with the data from the original analysis presented in the raw data section of the data package. For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, orthophosphate, and a 28-day holding time for sulfate. The analysis for pH and conductivity were exceeded by 2 and 22 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Arsenic, beryllium, boron, molybdenum, nickel, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-21-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample MMW-21-T01N-GRW, pH class A, applicable for 1 out of 24 analytes. The result for this one metal was within acceptance limits and data qualification was not necessary. The serial dilution results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-7-T01N-GRW, MMW-7-D01N-GRW, MMW-44A-T01N-GRW, and MMW-44A-D01N-GRW. Therefore, molybdenum and beryllium results for all samples were reported from the trace ICP. The trace ICP molybdenum and beryllium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample MMW-36B-T01N/D01N-GRW the analysis of dissolved chromium exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.3 summarizes these results and the data qualification. During the inorganic review process the cation/anion balance for samples MMW-7-T01N/D01N-GRW, and MMW-30A-T01N/D01N-GRW exhibited ion balance percent differences that were outside the validation limits. The results were compared to historical results and were found to differ significantly for sulfate. These samples were re-analyzed for sulfate beyond the holding time yielding results that brought the percent differences within the validation guidelines. Also, the ratios of calculated versus measured TDS were calculated and were within the guidelines except for MMW-7-T01N/D01N-GRW. This sample was re-analyzed for TDS outside of holding times yielding acceptable results. The reanalysis result was reported.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The orthophosphate and phosphorus results for sample MMW-7-T01N-GRW were qualified as estimated (J/UJ TVP-I) because the orthophosphate result was greater than the phosphorus result.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any site-specific field quality control samples. The field quality control results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. Initially, the fluoride reporting limit was incorrect due to a laboratory error in which the wrong reporting limit was imported into the reporting program. As such, the base fluoride reporting limit was 1.0 mg/L rather than 0.1 mg/L. The laboratory issued revised data sheets. Consequently, any on instrument concentrations between 0.1 mg/L and 1.0 mg/L (uncorrected for dilution) that were initially reported as nondetects were reported as detected concentrations on the revised data sheets.
Package Completeness	Yes	The laboratory submitted revised inorganics data sheets and electronic data to reflect the TDS reanalyses and corrected fluoride reporting limit. The revised data sheets were collated into the package, making the package complete.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Sulfate (mg/L)	Conductivity (umhos/cm)	pH
MMW-21-T01N-GRW	1.5 J	0.0098 J	---	---	---	3090 J	3.2 J
MMW-7-T01N-GRW	1.2 J	0.005 UJ	16.1 J	---	5410 J	5540 J	4.4 J
MMW-22-T01N-GRW	0.23 J	---	---	3930 J	---	3040 J	3.6 J
MMW-30A-T01N-GRW	2.8 J	---	---	---	1280 J	1760 J	4.5 J
MMW-27A-T01N-GRW	3.8 J	---	---	---	---	1860 J	4.4 J
MMW-44A-T01N-GRW	0.56 J	0.005 UJ	0.054 J	3950 J	---	3100 J	3.5 J
MMW-36B-T01N-GRW	---	---	---	5110 J	---	3980 J	4.3 J
MMW-8B-T01N-GRW	2.9 J	0.005 UJ	0.037 J	---	---	2310 J	5.5 J

-- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Arsenic (P) DF=10			7.3		4.1	MMW-30A-T01N-GRW, MMW-30A-D01N-GRW, MMW-44A-T01N-GRW	U CCB-I
Beryllium (P) DF=10		-0.7			0.4	MMW-21-T01N-GRW, MMW-21-D01N-GRW, MMW-22-T01N-GRW, MMW-22-D01N-GRW, MMW-30A-T01N-GRW, MMW-30A-D01N-GRW, MMW-27A-T01N-GRW, MMW-27A-D01N-GRW, MMW-36B-T01N-GRW, MMW-36B-D01N-GRW, MMW-8B-T01N-GRW, MMW-8B-D01N-GRW	UJ/J CCB-L
Boron (P) DF=10	8.0				6.3	MMW-21-T01N-GRW, MMW-21-D01N-GRW, MMW-7-T01N-GRW, MMW-7-D01N-GRW	U CCB-I
Molybdenum (P) DF=10		-4.2			1.1	All sample in this SDG.	UJ/J CCB-L
Nickel (P) DF=100	-13.1	-13.9	-12.0	-13.06	4.5	MMW-21-T01N-GRW, MMW-21-D01N-GRW, MMW-7-T01N-GRW, MMW-7-D01N-GRW, MMW-22-T01N-GRW, MMW-22-D01N-GRW, MMW-30A-T01N-GRW, MMW-30A-D01N-GRW, MMW-36B-T01N-GRW	UJ /J CCB-L
						All samples in this SDG.	UJ/J MB-L
Zinc (P) DF=100				14.61	1.9	MMW-21-T01N-GRW, MMW-21-D01N-GRW, MMW-7-T01N-GRW, MMW-7-D01N-GRW, MMW-22-T01N-GRW, MMW-22-D01N-GRW, MMW-30A-T01N-GRW, MMW-30A-D01N-GRW, MMW-27A-T01N-GRW, MMW-27A-D01N-GRW, MMW-36B-T01N-GRW, MMW-36B-D01N-GRW, MMW-8B-T01N-GRW, MMW-8B-D01N-GRW	U MB-I

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Dissolved Qualifications for Metals

Sample/Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
MMW-36B-T01N/D01N-GRW				
Chromium	393	110	Absolute difference <2x RL (220)	UJ/J TvP-I for samples MMW-36B-T01N-GRW and MMW-36B-D01N-GRW.
MMW-8B-T01N/D01N-GRW				
Manganese	467	160	Absolute difference <2x RL (320)	UJ/J TvP-I for samples MMW-8B-T01N-GRW and MMW-8B -D01N-GRW.

Note: The instrument detection limit (IDL), adjusted for dilution, is used as the reporting limit (RL) for total vs. partial evaluations.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT213C Sampling Event: October 2003 GRW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/25/03

Peer Reviewer: Stacey Coker Date Completed: 11/26/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
SPRING 14T-T01N-GRW	SA	547563		W	X	X
SPRING 14T-D01N-GRW	SA	547564		W	X	
SPRING 18-T01N-GRW	SA	547565		W	X	X
SPRING 18-D01N-GRW	SA	547566		W	X	
SPRING 15T-T01N-GRW	SA	547567		W	X	X
SPRING 15T-D01N-GRW	SA	547568		W	X	
SPRING 17-T01N-GRW	SA	547569		W	X	X
SPRING 17-D01N-GRW	SA	547570		W	X	
SPRING 17-T01D-GRW	FD	547571		W	X	X
SPRING 17-D01D-GRW	FD	547572		W	X	
SPRING 9-T01N-GRW	SA	547573		W	X	X
SPRING 9-D01N-GRW	SA	547574		W	X	
SPRING 12-T01N-GRW	SA	547575		W	X	X
SPRING 12-D01N-GRW	SA	547576		W	X	
SPRING 12A-T01N-GRW	SA	547577		W	X	X
SPRING 12A-D01N-GRW	SA	547578		W	X	
003 CENTRAL SEEP-T01N-GRW	SA	547579	003CNTRLSEEP-T01N-GRW	W	X	X
003 CENTRAL SEEP-D01N-GRW	SA	547580	003CNTRLSEEP-D01N-GRW	W	X	
MMW-19B-T01N-GRW	SA	547581		W	X	X
MMW-19B-D01N-GRW	SA	547582		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Field IDs 003 CENTRAL SEEP-T01N/D01N-GRW were truncated to 003CNTRLSEEP-T01N/D01N-GRW.
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 21 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, iron, molybdenum, and selenium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution SPRING 14T-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample SPRING 14T-T01N-GRW, pH class C, applicable for 1 out of 24 analytes. The serial dilution results for this one metal was within acceptance limits and data qualification was not necessary. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Field QC • Field Duplicate (FD) SPRING 17-T01D-GRW SPRING 17-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)		This package included field duplicate (FD) samples for which results for one analyte were slightly outside the control criteria as summarized in Table 1.3. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
SPRING 14T-T01N-GRW	0.41 J	0.005 UJ	0.01 UJ	447 J	8.3 J
SPRING 18-T01N-GRW	0.44 J	0.005 UJ	0.01 UJ	339 J	8.3 J
SPRING 15T-T01N-GRW	0.38 J	0.005 UJ	0.011 J	255 J	8.3 J
SPRING 17-T01N-GRW	0.40 J	0.005 UJ	0.012 J	437 J	7.5 J
SPRING 17-T01D-GRW	0.38 J	0.005 UJ	0.011 J	438 J	7.5 J
SPRING 9-T01N-GRW	0.52 J	0.005 UJ	0.05 J	794 J	7.3 J
SPRING 12-T01N-GRW	0.44 J	0.005 UJ	0.01 UJ	501 J	8.0 J
SPRING 12A-T01N-GRW	0.36 J	0.005 UJ	0.011 J	424 J	8.0 J
003 CENTRAL SEEP-T01N-GRW	0.2 UJ	---	---	2590 J	7.6 J
MMW-19B-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	2670 J	7.0 J

-- -= Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=10	51.4	45.4	57.6	91.1		30.7	003 CENTRAL SEEP-T01N-GRW	U CCB-I
Antimony (MS) DF=2	0.9	0.8	0.8	0.8		0.5	SPRING 14T-T01N-GRW	U CCB-I
Iron (P) DF=10	57.0		30.4			30.0	SPRING 14T-T01N-GRW, SPRING 17-T01N-GRW, SPRING 17-T01D-GRW, SPRING 9-T01N-GRW, SPRING 12-T01N-GRW, 003 CENTRAL SEEP-T01N-GRW	U CCB-I
Molybdenum (P) DF=1					1.356	1.1	MMW-19B-T01N-GRW, MMW-19B-D01N-GRW	U MB-I
Selenium (MS) DF=2	-0.5					0.3	SPRING 14T-T01N-GRW, SPRING 14T-D01N-GRW, SPRING 18-T01N-GRW, SPRING 18-D01N-GRW, SPRING 15T-T01N-GRW, SPRING 15T-D01N-GRW	UJ CCB-L

P=ICP MS = ICP-MS MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Field Duplicates Concentrations and Parent Sample Qualifications

Analyte	SPRING 17-T01N-GRW	SPRING 17-T01D-GRW	Criteria Comment	Outside Criteria	RL	Action
TDS (mg/l)	234	334	RPD<30%	RPD=35.2%	10	J FD-I parent samples

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT214A Sampling Event: October 2003 GRW/SFW

Matrix: Solid ____ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 12/23/03

Peer Reviewer: Stacey Coker Date Completed: 12/26/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
DOUGLAS WELL-T01N-GRW	SA	547603	DOUGLASWELL-T01N-GRW	W	X	X
DOUGLAS WELL-D01N-GRW	SA	547604	DOUGLASWELL-D01N-GRW	W	X	
MMW-11-T01N-GRW	SA	547605		W	X	X
MMW-11-D01N-GRW	SA	547606		W	X	
MMW-11A-T01N-GRW	SA	547607		W	X	X
MMW-11A-D01N-GRW	SA	547608		W	X	
MMW-19A-T01N-GRW	SA	547609		W	X	X
MMW-19A-D01N-GRW	SA	547610		W	X	
MMW-24-T01N-GRW	SA	547611		W	X	X
MMW-24-D01N-GRW	SA	547612		W	X	
MMW-10C-T01N-GRW	SA	547613		W	X	X
MMW-10C-D01N-GRW	SA	547614		W	X	
MMW-10C-T01D-GRW	FD	547615		W	X	X
MMW-10C-D01D-GRW	FD	547616		W	X	
MMW-10B-T01N-GRW	SA	547617		W	X	X
MMW-10B-D01N-GRW	SA	547618		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	As noted in the case narrative, the original nitrate as N analysis for sample MMW-24-T01N-GRW was accomplished within the analytical holding time. However, this sample required a dilution analysis, which was performed three days beyond the holding time. The results from this dilution analysis are formally presented in this SDG. For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 21 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Zinc was detected in the method blank. Table 1.2 summarizes the blank detection and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution DOUGLAS WELL-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample DOUGLAS WELL-T01N-GRW, pH class A, applicable for 0 out of 24 analytes. The serial dilution results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-10B-T01N-GRW and MMW-10B-D01N-GRW. Therefore, molybdenum and beryllium results for all samples were reported from the trace ICP. The trace ICP molybdenum and beryllium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample MMW-11-T01N/D01N-GRW the analysis of dissolved nickel exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.3 summarizes these results and the data qualification. The anion/cation balance percent difference exceeded the acceptance range of ±13% in samples DOUGLAS WELL-T01N/D01N-GRW (38.15%), MMW-11A-T01N/D01N-GRW (14.96%), MMW-19A-T01N/D01N-GRW (15.65%), and MMW-24-T01N/D01N-GRW (15.73%). Four of the cation concentrations contributing to the calculation of this balance (Ca^{2+}, K^{+}, Na^{+}, and Al^{3+}) were not detected above the instrument detection limit (IDL) and were therefore reported at the detection limit. Recalculation of the balance, using a value of one for all of the samples reported at the detection limit, resulted in a cation/anion balance of 8.64%, 6.09%, 7.12%, and 9.89%, respectively. The concentrations were low enough that reporting limits controlled the calculations. The balances were therefore not an appropriate measure of accuracy. No qualification was considered necessary.
Field QC • Field Duplicate (FD) MMW-10C-T01D-GRW MMW-10C-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	The field duplicate results satisfied the applicable concentration-dependent evaluation criteria and data qualification was not necessary. The field quality control results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. Initially, the fluoride reporting limit was incorrect due to a laboratory error in which the wrong reporting limit was imported into the reporting program. As such, the base fluoride reporting limit was 1.0 mg/L rather than 0.1 mg/L. The laboratory issued revised data sheets. Consequently, any on instrument concentrations between 0.1 mg/L and 1.0 mg/L (uncorrected for dilution) that were initially reported as nondetects were reported as detected concentrations on the revised data sheets.
Package Completeness	Yes	The laboratory submitted revised inorganics data sheets and electronic data to reflect the TDS reanalyses and corrected fluoride reporting limit. The revised data sheets were collated into the package, making the package complete.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
DOUGLAS WELL-T01N-GRW	0.64 J	0.005 UJ	0.01 UJ	489 J	5.7 J
MMW-11-T01N-GRW	4.1 J	0.005 UJ	0.024 J	2060 J	4.4 J
MMW-11A-T01N-GRW	3.7 J	0.005 UJ	0.035 J	1990 J	4.3 J
MMW-19A-T01N-GRW	---	---	---	1980 J	4.3 J
MMW-24-T01N-GRW	---	---	---	2740 J	5.0 J
MMW-10C-T01N-GRW	---	---	---	931 J	4.9 J
MMW-10C-T01D-GRW	---	---	---	947 J	4.9 J
MMW-10B-T01N-GRW	---	---	---	2570 J	6.1 J

--- = Samples were within holding time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Zinc (P) DF=100	8.596	1.9	DOUGLAS WELL-T01N-GRW, DOUGLAS WELL-D01N-GRW, MMW-10C-T01N-GRW, MMW-10C-D01N-GRW, MMW-10C-T01D-GRW, MMW-10C-D01D-GRW, MMW-10B-T01N-GRW, MMW-10B-D01N-GRW	U MB-I

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications for Metals

Sample/Analytes	Absolute Difference	RL	Evaluation Criteria	Action
MMW-11-T01N/D01N-GRW				
Nickel	1699	450	Evaluation criteria is met when the absolute difference is less than 2x RL (900)	J TVP-I for samples MMW-11-T01N-GRW and MMW-11-D01N-GRW.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT215C

Sampling Event: October 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 11/21/03

Peer Reviewer: Stacey Coker

Date Completed: 11/25/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
EMBARGO ROAD SEEP-T01N-GRW	SA	547689	EMBRGORDSEEP-T01N-GRW	W	X	X
EMBARGO ROAD SEEP -D01N-GRW	SA	547690	EMBRGORDSEEP-D01N-GRW	W	X	
SPRING 9A-T01N-GRW	SA	547691		W	X	X
SPRING 9A-D01N-GRW	SA	547692		W	X	
SPRING 10-T01N-GRW	SA	547693		W	X	X
SPRING 10-D01N-GRW	SA	547694		W	X	
003 EAST SEEP-T01N-GRW	SA	547695		W	X	X
003 EAST SEEP-D01N-GRW	SA	547696		W	X	
003 WEST SEEP-T01N-GRW	SA	547697		W	X	X
003 WEST SEEP-D01N-GRW	SA	547698		W	X	
EAST SEEP-T01N-GRW	SA	547699		W	X	X
EAST SEEP-D01N-GRW	SA	547700		W	X	
WEST SEEP-T01N-GRW	SA	547701		W	X	X
WEST SEEP-D01N-GRW	SA	547702		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Field IDs EMBARGO ROAD SEEP-T01N/D01N-GRW were truncated to EMBARGORDSEEP-T01N/D01N-GRW.
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 21 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, iron, selenium, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution EMBARGORDSEEP-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample EMBARGO ROAD SEEP-T01N-GRW, pH class C, applicable for 1 out of 24 analytes. The result for this one metal was within acceptance limits and data qualification was not necessary. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any field quality control samples. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
EMBARGO ROAD SEEP-T01N-GRW	0.49 J	0.005 UJ	0.019 J	1330 J	7.3 J
SPRING 9A-T01N-GRW	0.88 J	0.005 UJ	0.060 J	691 J	7.4 J
SPRING 10-T01N-GRW	0.27 J	0.005 UJ	0.019 J	501 J	7.7 J
003 EAST SEEP-T01N-GRW	0.20 UJ	---	---	1910 J	7.7 J
003 WEST SEEP-T01N-GRW	0.20 UJ	---	---	2280 J	7.7 J
EAST SEEP-T01N-GRW	0.20 UJ	---	---	1750 J	8.0 J
WEST SEEP-T01N-GRW	0.20 UJ	---	---	1600 J	7.6 J

-- -= Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=10	32.8				30.7	EMBARGO ROAD SEEP-T01N-GRW, SPRING 9A-T01N-GRW	U CCB-I
Iron (P) DF=10				-40.54	30.0	EMBARGO ROAD SEEP-T01N-GRW, EMBARGO ROAD SEEP-D01N-GRW, SPRING 9A-T01N-GRW, SPRING 9A-D01N-GRW, SPRING 10-T01N-GRW, SPRING 10-D01N-GRW, 003 EAST SEEP-T01N-GRW, 003-EAST SEEP-D01N-GRW, 003 WEST SEEP-T01N-GRW, 003 WEST SEEP-D01N-GRW, EAST SEEP-T01N-GRW, EAST SEEP-D01N-GRW, WEST SEEP-D01N-GRW	UJ/J MB-L
Selenium (MS) DF=2			0.4		0.3	EMBARGO ROAD SEEP-T01N-GRW, EMBARGO ROAD SEEP-D01N-GRW, SPRING 9A-D01N-GRW, SPRING 10-T01N-GRW, SPRING 10-D01N-GRW,	U MB-I
						003 EAST SEEP-T01N-GRW, 003-EAST SEEP-D01N-GRW, 003 WEST SEEP-T01N-GRW, 003 WEST SEEP-D01N-GRW, EAST SEEP-T01N-GRW, EAST SEEP-D01N-GRW, WEST SEEP-T01N-GRW, WEST SEEP-D01N-GRW	U CCB, MB-I
Zinc (P) DF=10				2.41	2.0	SPRING 9A-T01N-GRW, SPRING 9A-D01N-GRW, WEST SEEP-T01N-GRW	U MB-I

P=ICP MS = ICP-MS MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT216S

Sampling Event: October 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Ansley Watson

Date Completed: 11/24/03

Peer Reviewer: Stacey Coker

Date Completed: 11/26/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses			
					Metals	Inorganincs	BOD/COD	TPH
DECANT-T01N-SFW	SA	547703	DECANTT01NSF	W	X	X	X	X
DECANT-D01N-SFW	SA	547704		W	X			
OUTFALL 002-T01N-GRW	SA	547705		W	X	X		
OUTFALL 002-D01N-GRW	SA	547706		W	X			
OUTFALL 002 PIPE-T01N-GRW	SA	547707	OUTFALL2PIPE-T01N-GRW	W	X	X		
OUTFALL 002 PIPE-D01N-GRW	SA	547708	OUTFALL2PIPE-D01N-GRW	W	X			

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: T he following issues were noted in the case narrative.

As noted in the case narrative, although the "OUTFALL" samples in this sample delivery group are designated as "class C" groundwater, they were analyzed for metals like surface waters.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Field IDs OUTFALL 002 PIPE-T01N/D01N-GRW were truncated to OUTFALL2PIPE-T01N/D01N-GRW.
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 21 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, chromium, and iron were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution DECANT-T01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis, conducted on sample DECANT-T01N-SFW, pH class C, was applicable for 5 out of 24 analytes. The results for all five metals were within acceptance limits and data qualification was not necessary. The serial dilution results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any field quality control samples. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Review Parameter	Criteria Met?	Comments
Laboratory-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
DECANT-T01N-SFW	0.20 UJ	---	---	2740 J	8.7 J
OUTFALL 002-T01N-GRW	0.25 J	---	---	1640 J	7.8 J
OUTFALL 002 PIPE-T01N-GRW	0.25 J	0.005 UJ	0.047 J	1620 J	7.7 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=1		26.2	38.4		22.1	DECANT-T01N-SFW, DECANT-D01N-SFW, OUTFALL 002-T01N-GRW	U CCB-I
Antimony (MS) DF=1	0.8	0.7			0.5	DECANT-T01N-SFW, DECANT-D01N-SFW	U CCB-I
Chromium (P) DF=1				1.161	1.1	OUTFALL 002-T01N-GRW, OUTFALL 002-D01N-GRW, OUTFALL 002 PIPE-T01N-GRW, OUTFALL 002 PIPE-D01N-GRW	U MB-I
Iron (P) DF=1			27.8		27.8	OUTFALL 002-T01N-GRW	U CCB-I

P=ICP MS = ICP-MS MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT217A

Sampling Event: October 2003 GRW and SFW

Matrix: Solid ____ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted

Date Completed: 12/19/03

Peer Reviewer: Stacey Coker

Date Completed: 01/11/04

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
MMW-23A-T01N-GRW*	SA	547894		W	X	X
MMW-23A-D01N-GRW*	SA	547895		W	X	
CAPULIN1-T01N-GRW*	SA	547896		W	X	X
CAPULIN1-D01N-GRW*	SA	547897		W	X	
SPRING14MA-T01N-GRW*	SA	547898		W	X	X
SPRING14MA-D01N-GRW*	SA	547899		W	X	
CAPULINSPRING-T01N-GRW*	SA	547900	CAPSPRING-T01N-GRW	W	X	X
CAPULINSPRING-D01N-GRW*	SA	547901	CAPSPRING-D01N-GRW	W	X	
SC-1A-T01N-GRW	SA	547902		W	X	X
SC-1A-D01N-GRW	SA	547903		W	X	
WALDOSPRING-T01N-GRW	SA	547904	WALDOSPRING-T01N-GR	W	X	X
WALDOSPRING-D01N-GRW	SA	547905	WALDOSPRING-D01N-GR	W	X	
GOATHILLSPRING-T01N-GRW*	SA	547906	GOATHILLSPRG-T01N-GRW GOATHILLSPRG-T01N-G	W	X	X
GOATHILLSPRING-D01N-GRW*	SA	547907	GOATHILLSPRG-D01N-GRW GOATHILLSPRG-D01N-G	W	X	
SULFURGULCHSEEP-T01N-GRW*	SA	547908	SULFURGULCH-T01N-GRW SULFURGULCH-T01N-GR	W	X	X
SULFURGULCHSEEP-D01N-GRW*	SA	547909	SULFURGULCH-D01N-GRW SULFURGULCH-D01N-GR	W	X	
SPRING14M-T01N-GRW*	SA	547910		W	X	X
SPRING14M-D01N-GRW*	SA	547911		W	X	
UPPERSPRING39-T01N-GRW*	SA	547912	UPPERSPRNG39-T01N-GRW UPPERSPRNG39-T01N-G	W	X	X
UPPERSPRING39-D01N-GRW*	SA	547913	UPPERSPRNG39-D01N-GRW UPPERSPRNG39-D01N-G	W	X	
MMW-34B-T01N-GRW*	SA	547914		W	X	X
MMW-34B-D01N-GRW*	SA	547915		W	X	
MMW-32A-T01N-GRW*	SA	547916		W	X	X
MMW-32A-D01N-GRW*	SA	547917		W	X	

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

2 Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the Laboratory Form Field ID.

*DP-1055 compliance samples.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. As the samples were collected under the RI/FS, the data package included results for permit-required parameters and additional RI/FS parameters. This data review summary is limited to the metals and inorganic analyses.

Case Narrative Summary:

Due to the elevated percent recoveries on the ICP/MS of the yttrium internal standard in many of the samples in this delivery group, selenium, which has been shown to be affected by yttrium was reported from the trace ICP analysis. In addition, results for beryllium and molybdenum which are quantitated using the internal standard yttrium were also reported for the trace ICP rather than the ICPMS.

Additional issues addressed in the case narrative are summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	Sample handling noted that some of the sample identifications were shortened. Refer to above table for the abbreviated sample identifiers.
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires the immediate analysis of the samples upon arrival at the laboratory. Conductivity was measured 19 to 25 days after samples were received by lab and pH was measured 7 hours after samples were received by lab. Table 1.1 summarizes the holding times not meeting the acceptance criteria and the resulting qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS MMW-23A-T01N-GRW MMW-23A-D01N-GRW CAPULINSPRING-T01N-GRW CAPULINSPRING-D01N-GRW • LD MMW-23A-T01N-GRW MMW-23A-D01N-GRW CAPULINSPRING-T01N-GRW CAPULINSPRING-D01N-GRW	No	Table 1.3 summarizes the MS/PDS results outside the evaluation criteria and the resultant data qualifications. For analytes in which the PDS result was outside control limits but the associated MS was within, qualification was not deemed necessary and the results were not included within Table 1.3. Table 1.4 summarizes the LD results outside the evaluation criteria and the resultant data qualifications. The matrix quality control results for the October 2003 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-23A-T01N-GRWS MMW-23A-D01N-GRWS CAPULINSPRING-T01N-GRWS CAPULINSPRING-D01N-GRWS • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on the matrix spike of sample MMW-23A-T01N-GRW was applicable for 3 out of 24 analytes. The serial dilution analysis conducted on the matrix spike of sample MMW-23A-D01N-GRW was applicable for 4 out of 24 analytes. The serial dilution analysis conducted on the matrix spike of sample CAPULINSPRING-T01N-GRW was applicable for 6 out of 24 analytes. The serial dilution analysis conducted on the matrix spike of sample CAPULINSPRING-D01N-GRW was applicable for 6 out of 24 analytes. Table 1.5 summarizes the serial dilution results outside the evaluation criteria and the resultant data qualifications. The serial dilution results for the October 2003 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		Table 1.6 summarizes the total versus partial results outside the evaluation criteria and the resultant data qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion except WALDOSPRING-T/D01N-GRW, SULFURGULCHSEEP-T/D01N-GRW and SPRING14M-T/D01N-GRW which yielded values of 14.38%, 27.48% and 20.06 %, respectively. The high cation/anion balances are attributed to elevated cation reporting limits (mainly potassium and sodium) associated with the class "A" dilution scheme. Therefore, no qualification was deemed necessary. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5 except SULFURGULCHSEEP-T/D01N-GRWwhich yielded a value of 0.26. As stated in the case narrative, the laboratory investigated the elevated TDS result and re-analyzed the sample outside the prescribed analytical holding time of seven days . The revised result for TDS measured brought the TDS ratio to 1.29, thereby removing any need to qualify this result on the basis of TDS ratio imbalance. The TDS result for this sample was qualified as estimated on the basis of holding time, with an indeterminate bias direction.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	N/A	This package did not include any field QC data. The field quality control results for the October 2003 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Sulfate (mg/L)	TDS (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
MMW-23A-T01N-GRW	---	---	0.20 UJ	0.0050 UJ	0.010 UJ	2660 J	5.4 J
CAPULIN1-T01N-GRW	---	3890 J	0.20 UJ	0.0071 J	0.026 J	3570 J	3.4 J
SPRING14MA-T01N-GRW	---	---	0.20 UJ	0.0050 UJ	0.010 UJ	732 J	4.4 J
CAPULINSPRING-T01N-GRW	---	21600 J	1.0 UJ	0.0603 J	17.8 J	12300 J	2.9 J
SC-1A-T01N-GRW	---	---	0.20 UJ	0.0050 UJ	0.026 J	2720 J	3.7 J
WALDOSPRING-T01N-GRW	---	---	0.20 UJ	0.0050 UJ	0.010 UJ	821 J	5.2 J
GOATHILLSPRING-T01N-GRW	---	22900 J	1.0 UJ	0.0539 J	15.0 J	11500 J	2.8 J
SULFURGULCHSEEP-T01N-GRW	302 J	512 J	0.36 J	0.0050 UJ	0.010 UJ	704 J	4.7 J
SPRING14M-T01N-GRW	---	---	0.20 UJ	0.0050 UJ	0.010 UJ	533 J	4.6 J
UPPERSPRING39-T01N-GRW	---	---	0.71 J	0.0050 UJ	0.11 J	977 J	5.9 J
MMW-34B-T01N-GRW	---	---	2.8 J	0.0050 UJ	0.010 UJ	2810 J	5.1 J
MMW-32A-T01N-GRW	---	---	3.0 J	0.0050 UJ	0.010 UJ	2110 J	5.1 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	PBW 1202A (µg/l)	PBW 1202B (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Beryllium (P) DF=10	---	-0.3	-0.7	-0.5	---	0.4	---	-0.688	0.3	SPRING14MA-T01N-GRW SPRING14MA-D01N-GRW SC-1A-T01N-GRW SC-1A-D01N-GRW WALDOSPRING-T01N-GRW WALDOSPRING-D01N-GRW SULFURGULCHSEEP-T01N-GRW SULFURGULCHSEEP-D01N-GRW SPRING14M-T01N-GRW SPRING14M-D01N-GRW UPPERSPRING39-T01N-GRW UPPERSPRING39-D01N-GRW MMW-32A-D01N-GRW	J MB,CCB-L or UJ MB,CCB-L or UJ MB,CCB-I
Zinc (P) DF=100	---	---	---	---	2.8	3.7	3.333	4.041	1.9	WALDOSPRING-D01N-GRW SULFURGULCHSEEP-T01N-GRW SULFURGULCHSEEP-D01N-GRW	U MB-I

P = ICP MS = ICP-MS CV = Cold Vapor PBW = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
RL = Reporting Limit IDL = RL for metals
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike and Post Digestion Spike Results
Not Meeting Acceptance Criteria and Data Qualification

Analyte	Matrix Spike Result (mg/L)	Sample Result (mg/L)	Spike Added	% Recovery	PDS % Recovery	Criteria	Comments	Qualification Codes
MMW-23A-T01N-GRW								
Alkalinity	18.8	92.8	100	74.0	NA	75-125%	Acidic nature of sample neutralizes the spike resulting in reduced recovery.	No Qualification
Ammonia	0.15	0.71	0.833	67.2			None	J MS-L
CAPULINSPRING-T01N-GRW								
Alkalinity	1.0 U	2.0	100	2.0	NA	75-125%	Acidic nature of sample neutralizes the spike resulting in reduced recovery.	No Qualification
Nitrite	0.0603	0.0493	0.021	0.0			None	J MS-L
Phosphorous	0.052	0.14	0.5	17.6				
TOC	13.2	18.5	10	53.0				
MMW-23A-T01N-GRW								
Cadmium	130 U	130 U	100	0.0	NA	75-125%	NA because ND and RL > spike level	No Qualification
Copper	628	230 U	500	125.6			79.6% if use RL for ND rather than 0 in calculation	
Iron	2.78 $x10^2$ U	3.60 $x10^2$	2000	0.0			NA because spiked sample is ND and RL > spike level	
Manganese	491 $x10^2$	472 $x10^2$	1000	191.0			Sample conc. > 4x spike conc.	
Selenium	30.0 U	30.0 U	20	0.0			NA because ND and RL > spike level	
Zinc	9.18 $x10^3$	8.84 $x10^3$	1000	34.0			Sample conc. > 4x spike conc.	
Cyanide	74.0	10.0 U	100	74.0			None	UJ MS-L
MMW-23A-D01N-GRW								
Cadmium	130 U	130 U	100	0.0	NA	75-125%	NA because ND and RL > spike level	No Qualification
Iron	7.70 $x10^3$	4.55 $x10^3$ U	2000	385.2			NA because sample is ND and RL > spike level	
Manganese	4.67 $x10^4$	4.50 $x10^4$	1000	164.0			Sample conc. > 4x spike conc.	
Selenium	36.2	30.0 U	20	180.8			NA because sample is ND and RL > spike level	

Table 1.3
Matrix Spike and Post Digestion Spike Results
Not Meeting Acceptance Criteria and Data Qualification

Analyte	Matrix Spike Result (mg/L)	Sample Result (mg/L)	Spike Added	% Recovery	PDS % Recovery	Criteria	Comments	Qualification Codes
CAPULINSPRING-T01N-GRW								
Aluminum	1.19×10^6	1.14×10^6	4000	1325.0	157.0	75-125%	Sample conc. > 4x spike conc.	No Qualification
Antimony	690.1	82.0 U	1000	69.0	69.2		None	UJ PDS, MS-L
Arsenic	210	156	80	67.6	68.2			J PDS, MS-L
Barium	2.55×10^3	117 U	4000	63.6	55.2			UJ PDS, MS-L
Beryllium	372	307	100	64.9	69.2			J PDS, MS-L
Boron	689	64.0 U	1000	69.0	NA			UJ MS-L
Chromium	1044.0	501	400	135.8				J MS-H
Copper	1.04×10^4	9.42×10^3	500	202.8			Sample conc. > 4x spike conc.	No Qualification
Iron	4.42×10^5	4.21×10^5	2000	1055.0	146.0			
Manganese	5.66×10^5	5.44×10^5	1000	2280.0	199.2			
Molybdenum	581	12.0 U	1000	58.1	66.5		None	J PDS, MS-L
Nickel	1.02×10^4	8.74×10^3	1000	143.1	NA		Sample conc. > 4x spike conc.	No Qualification
Zinc	1.32×10^5	1.25×10^5	1000	640.0	126.0			
Cyanide	36.1	10.0 U	100	36.1	NA		None	UJ MS-L
CAPULINSPRING-D01N-GRW								
Aluminum	1.17×10^6	1.15×10^6	4000	425.0	NA	75-125%	Sample conc. > 4x spike conc.	No Qualification
Antimony	680	82.0 U	1000	68.0	69.9		None	UJ PDS, MS-L
Arsenic	223	166	80	70.8	65.1			J PDS, MS-L
Barium	2.67×10^3	117 U	4000	66.6	55.4			UJ PDS, MS-L
Boron	706	64.0 U	1000	70.6	NA			UJ MS-L
Chromium	987	444	400	135.6				J MS-H
Iron	4.32×10^5	4.27×10^5	2000	235.0			Sample conc. > 4x spike conc.	No Qualification
Manganese	5.54×10^5	5.48×10^5	1000	530.0				
Molybdenum	584	12.0 U	1000	58.4	65.9		None	UJ PDS, MS-L
Selenium	210	206	20	18.0	72.2		Sample conc. > 4x spike conc.	No Qualification
Zinc	1.29×10^5	1.27×10^5	1000	270.0	NA			

NA = Not appropriate

Table 1.4
Laboratory Duplicate Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Result (mg/L)	Duplicate Result (mg/L)	RPD	RL (mg/L)	Criteria	Qualification Codes
MMW-23A-T01N-GRW	Total Alkalinity	18.8	24.2	25	1.0	RPD ≤ 20%	J D-I
	Ammonia	0.15	0.12	22	0.040		
CAPULINSPRING-T01N-GRW	Chloride	10.5	15.5	38	1.0		
	Ammonia	0.34	0.42	21	0.04		

RL = Reporting Limit ND = Non-Detect

Table 1.5
Serial Dilutions Resulting in Parent Sample Qualifications

Sample	Analyte	%D	Qualification Codes
MMW-23A-T01N-GRW	Molybdenum	18.0	UJ DL-L
MMW-23A-D01N-GRW	Zinc	160.3	J DL-L
CAPULINSPRING-T01N-GRW	Beryllium	29.9	
	Zinc	11.8	
CAPULINSPRING-D01N-GRW	Beryllium	32.3	
	Zinc	20.2	

Table 1.6
Total vs. Partial Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Concentration[1]	RL	Criteria	Qualification Codes
CAPULINSPRING-T01N-GRW	Orthophosphorous	17.8	0.500	|Diff| >2xRL	J TvP-I
	Phosphorous	0.052	0.010		
GOATHILLSPRING-T01N-GRW	Orthophosphorous	15.0	0.500	|Diff| >2xRL	J TvP-I
	Phosphorous	0.016	0.010		
UPPERSPRING39-T01N-GRW	Orthophosphorous	0.11	0.010	|Diff| >2xRL	J TvP-I
	Phosphorous	0.010 U	0.010		UJ TvP-I
MMW-23A-T01N-GRW MMW-23A-D01N-GRW	Zinc	8840 12300	230	% Diff >30%	J TvP-I

RL = Reporting Limit RL = Instrument Detection Limit (IDL) for Metals ND = Non-Detect

[1]Concentrations of metals are in units of ug/L. Concentrations of Orthophosphorous and Phosphorous are in units of mg/L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT218C Sampling Event: October 2003

Matrix: Solid ____ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 11/14/03

Peer Reviewer: Stacey Coker Date Completed: 11/17/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
TPZ-2-T01N-GRW	SA	547943		W	X	X
TPZ-2-D01N-GRW	SA	547944		W	X	
TPZ-1-T01N-GRW	SA	547945		W	X	X
TPZ-1-D01N-GRW	SA	547946		W	X	
TPZ-5B-T01N-GRW	SA	547947		W	X	X
TPZ-5B-D01N-GRW	SA	547948		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For all samples, the 48 hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 17 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Laboratory Blank Results	No	Aluminum and mercury were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution TPZ-2-T01N-GRW Internal Standards Total vs. Partial Analyses Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample TPZ-2-T01N-GRW, pH class C, and was applicable for 0 out of 24 analytes. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any field quality control samples. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
TPZ-2-T01N-GRW	0.37 J	0.005 UJ	0.01 UJ	508 J	5.1 J
TPZ-1-T01N-GRW	1.0 J	0.005 UJ	0.01 UJ	829 J	7.7 J
TPZ-5B-T01N-GRW	0.2 J	0.005 UJ	0.01 UJ	655 J	7.5 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=10		-30.11	22.1	TPZ-2-T01N-GRW, TPZ-2-D01N-GRW, TPZ-1-T01N-GRW, TPZ-1-D01N-GRW, TPZ-5B-D01N-GRW	UJ/J MB-L
Mercury (CV) DF=1	-0.1		0.1	TPZ-2-T01N-GRW, TPZ-2-D01N-GRW, TPZ-1-T01N-GRW, TPZ-1-D01N-GRW, TPZ-5B-T01N-GRW, TPZ-5B-D01N-GRW	UJ/J CCB-L

P=ICP CV = Cold Vapor MB = Method Blank CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit
RL = Reporting Limit
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT219C

Sampling Event: October 2003 Groundwater

Matrix: Solid ____ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 12/19/03

Peer Reviewer: Stacey Coker

Date Completed: 1/12/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
MMW-29B-T01N-GRW	SA	547983		W	X	X
MMW-29B -D01N-GRW	SA	547984		W	X	
MMW-18B-T01N-GRW	SA	547985		W	X	X
MMW-18B-D01N-GRW	SA	547986		W	X	
MMW-23B-T01N-GRW	SA	547987		W	X	X
MMW-23B-D01N-GRW	SA	547988		W	X	
CHAMBER SPRING-T01N-GRW	SA	547989	CHAMBERSPRING-T01N-GRW	W	X	X
CHAMBER SPRING-D01N-GRW	SA	547990	CHAMBERSPRING-D01N-GRW	W	X	
SC-1B-T01N-GRW	SA	547991		W	X	X
SC-1B-D01N-GRW	SA	547992		W	X	
MMW-32B-T01N-GRW	SA	547993		W	X	X
MMW-32B-D01N-GRW	SA	547994		W	X	
MMW-25B-T01N-GRW	SA	547995		W	X	X
MMW-25B-D01N-GRW	SA	547996		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

As noted in the case narrative, thirty-nine samples were accidentally analyzed between calibration verification samples during the nitrate as N analysis by Method 324.1. The samples were well outside of the holding time once the error was discovered so the samples were not reanalyzed. As acceptable recoveries were obtained for bracketing CCVs, data qualification was not considered necessary

As noted in the case narrative, the continuing calibration verification (CCV) sample associated with the original alkalinity analysis of the samples designed MMW-18B-T01N-GRW and MMW-23B-T01N-GRW yielded a percent recovery (112.6%) slightly outside of established control limits. These samples were reanalyzed yielding similar results. The results from the first analysis have been reported. Total alkalinity was detected in samples MMW-18B-T01N-GRW and MMW-23B-T01N-GRW; therefore the sample results were qualified as estimated (J CCV-H).

As noted in the case narrative, the metals analysis of the CCV1 standard associated with analytical sequence from 11/29/03 yielded a percent recovery of 88.3% for arsenic. Although, the case narrative stated that arsenic was out, further review showed that it was really antimony that was out of limits. As MMW-29B-T01N-GRW was the only associated sample, the antimony result for this sample was qualified as estimated (J CCV-L).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 27 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, beryllium, chromium, potassium, selenium, sodium, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-29B-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample MMW-29B-T01N-GRW, pH class C, applicable for 2 out of 24 analytes. The result for this one metal was within acceptance limits and data qualification was not necessary. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For sample SC-1B-T01N-GRW the analysis of dissolved orthophosphate exceeded that of the total analysis of phosphorus beyond variation expected due to the accuracy limitations of the method. Table 1.3 summarizes these results and the data qualification.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any site-specific field quality control samples. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
MMW-29B-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1020 J	7.4 J
MMW-18B-T01N-GRW	0.60 J	0.0055 J	0.01 UJ	2960 J	7.0 J
MMW-23B-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	768 J	7.8 J
CHAMBER SPRING-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	291 J	8.0 J
SC-1B-T01N-GRW	0.20 UJ	0.005 UJ	0.048 J	3270 J	7.0 J
MMW-32B-T01N-GRW	0.40 UJ	0.005 UJ	0.01 UJ	2830 J	6.9 J
MMW-25B-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	2600 J	7.1 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=10		74.4	112.0	110.6	142.7	-23.78	22.1	MMW-18B-T01N-GRW	U CCB-I
								All sample in this SDG with the exception of MMW-18B-T01N-GRW	UJ MB-L
Antimony (MS) DF=2	0.9	0.7	0.8				0.5	MMW-29B-T01N-GRW	U CCB-I
Beryllium (P) DF=1	0.4	0.7					0.4	MMW-29B-T01N-GRW, MMW-29B-D01N-GRW, MMW-23B-T01N-GRW, MMW-23B-D01N-GRW, CHAMBER SPRING-T01N-GRW, CHAMBER SPRING-D01N-GRW, SC-1B-T01N-GRW, SC-1B-D01N-GRW, MMW-25B-T01N-GRW, MMW-25B-D01N-GRW	U CCB-I
Chromium (P) DF=1	-5.0	-5.0	-5.2			-4.394	1.1	All samples in this SDG.	UJ/J CCB, MB-L
Potassium (P) DF=1		-553.8					318.0	MMW-29B-T01N-GRW, MMW-29B-D01N-GRW, MMW-23B-T01N-GRW, MMW-23B-D01N-GRW, CHAMBER SPRING-T01N-GRW, CHAMBER SPRING-D01N-GRW,	J CCB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Selenium (MS) DF=2						0.604	0.3	MMW-29B-T01N-GRW, MMW-18B-T01N-GRW, MMW-18B-D01N-GRW, CHAMBER SPRING-D01N-GRW, SC-1B-T01N-GRW, SC-1B-D01N-GRW, MMW-32B-T01N-GRW, MMW-32B-D01N-GRW	U MB-I
Sodium (P) DF=10			-768.1				453.8	MMW-29B-T01N-GRW, MMW-29B-D01N-GRW, CHAMBERSPRING-T01N-GRW, CHAMBERSPRING-D01N-GRW	UJ/J CCB-L
Zinc (P) DF=10			6.2	6.1	5.8		2.3	MMW-25B-T01N-GRW, MMW-25B-D01N-GRW	U CCB-I

P = ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit DF = listed are for field sample; not blank samples
For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Dissolved Qualifications for Metals

Sample/Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
SC-1B-T01N-GRW				
Orthophosphate vs. Phosphorus	0.028	0.01	Absolute difference <2x RL (0.02)	J TvP-I for sample SC-1B-T01N-GRW

Note: The instrument detection limit (IDL) is used as the reporting limit (RL) for total vs. partial evaluations.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT220A Sampling Event: October 2003 Groundwater

Matrix: Solid ____ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 12/23/03

Peer Reviewer: Stacey Coker Date Completed: 1/13/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
MMW-39A-T01N-GRW	SA	548153/117579-01		W	X	X
MMW-39A-D01N-GRW	SA	548154		W	X	
MMW-35B-T01N-GRW	SA	548155/117579-02		W	X	X
MMW-35B-D01N-GRW	SA	548156		W	X	
MMW-28B-T01N-GRW	SA	548157/117579-03		W	X	X
MMW-28B-D01N-GRW	SA	548158		W	X	
MMW-40A-T01N-GRW	SA	548159/117579-04		W	X	X
MMW-40A-D01N-GRW	SA	548160		W	X	
HOTTENTOT-T01N-GRW	SA	548161117579-05		W	X	X
HOTTENTOT-D01N-GRW	SA	548162		W	X	
HANSEN-T01N-GRW	SA	548163/117579-06		W	X	X
HANSEN-D01N-GRW	SA	548164		W	X	
SC-7A-T01N-GRW	SA	548165/117579-07		W	X	X
SC-7A-D01N-GRW	SA	548166		W	X	
SC-3A-T01N-GRW	SA	548167/117579-08		W	X	X
SC-3A-D01N-GRW	SA	548168		W	X	
SC-5A-T01N-GRW	SA	548169/117579-09		W	X	X
SC-5A-D01N-GRW	SA	548170		W	X	
LOWER SPRING 13-T01N-GRW	SA	548171/117579-10	LOWERSPRNG13-T01N-GRW	W	X	X
LOWER SPRING 13-D01N-GRW	SA	548172	LOWERSPRNG13-D01N-GRW	W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]The Laboratory IDs include both the IDs for STL-Burlington and STL-Seattle, respectively.

[3]Due to the TKN being subcontracted to STL Seattle some field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

Due to an accidental oversight by the laboratory, the default fluoride reporting limit on the master spreadsheet was inadvertently changed from 0.1mg/l to 1mg/l, resulting in fluoride reporting limits that were a factor of 10 too high. The laboratory provided revised data sheets and electronic data containing the correct fluoride reporting limit and results. As a result of this correction, fluoride results for which the on-instrument concentration was between 0.1 mg/L and 1.0 mg/L were reported as detectable concentrations in the revised data.

As noted in the case narrative, the TKN analyses by method 351.3 were subcontracted to Severn Trent Laboratories (STL) Seattle, Washington facility. The SDG provided by STL-Seattle was included in its entirety at the end of the STL-Burlington submittal.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	Field IDs LOWERSPRING 13-T01N/D01N-GRW were truncated to LOWERSPRING13-T01N/D01N-GRW.
Holding Times	No	The original total dissolved solids (TDS) analysis of sample MMW-39A-T01N-GRW, which was performed within holding time, yielded a net weight after drying that greatly exceeded the upper limit of the method. This sample was re-analyzed outside of holding time using a smaller volume yielding results comparable to the original analysis. The results from the re-analysis have been formally presented in this case submittal, with the data from the original analysis being presented in the raw data section of the data package. Also, the original nitrate analysis of samples MMW-39A-T01N-GRW and MMW-35B-T01N-GRW were accomplished within the analytical holding time. However, due to interference related to the sample matrix, this sample was re-analyzed at dilution 6 days beyond holding time. The result from the dilution analysis has been formally presented. For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 20 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Copper was detected in the continuing calibration blank. Table 1.2 summarizes the blank detection and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-39A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample MMW-39A-T01N-GRW, pH class A, applicable for 4 out of 24 analytes. The result for this one metal was within acceptance limits and data qualification was not necessary. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-39B-T01N-GRW, and MMW-39B-D01N-GRW. Therefore, molybdenum and beryllium results for all samples were reported from the trace ICP. The trace ICP molybdenum and beryllium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The anion/cation balance percent difference exceeded the acceptance range of ±13% in sample MMW-28B-T01N/D01N-GRW (16.73%). Four of the cation concentrations contributing to the calculation of this balance (Ca^{2+}, K^{+}, Na^{+}, and Al^{3+}) were not detected above the instrument detection limit (IDL) and were therefore reported at the detection limit. Recalculation of the balance, using a value of one for all of the samples reported at the detection limit, resulted in a cation/anion balance of 10.22%. The concentrations were low enough that reporting limits controlled the calculations. The balances were therefore not considered an appropriate measure of accuracy. No qualification was considered necessary.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any site-specific field quality control samples. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Conductivity (umhos/cm)	pH
MMW-39A-T01N-GRW	19.0 J	0.022 J	0.01 UJ	5860 J	4390 J	4.5 J
MMW-35B-T01N-GRW	0.40 UJ	0.005 UJ	0.01 UJ	---	3200 J	6.6 J
MMW-28B-T01N-GRW	---	---	---	---	889 J	5.4 J
MMW-40A-T01N-GRW	---	0.005 UJ	0.1 J	---	1060 J	6.4 J
HOTTENTOT-T01N-GRW	---	---	---	---	1430 J	3.2 J
HANSEN-T01N-GRW	0.20 UJ	0.005 UJ	0.017 J	---	2720 J	3.8 J
SC-7A-T01N-GRW	---	---	---	---	1560 J	4.0 J
SC-3A-T01N-GRW	---	---	---	---	2320 J	4.0 J
SC-5A-T01N-GRW	---	---	---	---	1380 J	3.4 J
LOWER SPRING 13-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	---	1900 J	3.6 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB3 (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Copper (P) DF=100	-2.9	2.3	SC-5A-D01N-GRW, LOWER SPRING 13-T01N-GRW, LOWER SPRING 13-D01N-GRW, HOTTENTOT-T01N-GRW	UJ/J CCB-L

P = ICP MS = ICP-MS CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit

DF = Dilution Factor (field sample only)

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT221C

Sampling Event: October 2003 Groundwater

Matrix: Solid ____ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 12/5/03

Peer Reviewer: Stacey Coker

Date Completed: 12/8/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
SC-8A-T01N-GRW	SA	548229/117580-01		W	X	X
SC-8A -D01N-GRW	SA	548230		W	X	
MMW-43A-T01N-GRW	SA	548231/117580-02		W	X	X
MMW-43A-D01N-GRW	SA	548232		W	X	
EW-5A-T01N-GRW	SA	548233/117580-03		W	X	X
EW-5A-D01N-GRW	SA	548234		W	X	
SC-5B-T01N-GRW	SA	548235/117580-04	SC-5B-T01N	W	X	X
SC-5B-D01N-GRW	SA	548236		W	X	
SC-2B-T01N-GRW	SA	548237/117580-05		W	X	X
SC-2B-D01N-GRW	SA	548238		W	X	
RB06T-GRW	RB	548239/117580-06		W	X	X
RB06D-GRW	RB	548240		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]The Laboratory IDs include both the IDs for STL-Burlington and STL-Seattle, respectively.

[3]Due to the TKN being subcontracted to STL Seattle some field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

As noted in the case narrative, the TKN analyses by method 351.3 were subcontracted to Severn Trent Laboratories (STL) Seattle, Washington facility. The SDG provided by STL-Seattle was included in its entirety at the end of the STL-Burlington submittal.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 21 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, boron, molybdenum, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution SC-8A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample SC-8A-T01N-GRW, pH class C, applicable for 1 out of 24 analytes. The result for this one metal was within acceptance limits and data qualification was not necessary. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For sample EW-5A-T01N/D01N-GRW the analysis of dissolved nickel exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.3 summarizes these results and the data qualification. For sample RB06T/D-GRW, the cation/anion balances were outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary based on the ion balance. However, in calculating the charge balances, it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit for sample RB06T/D-GRW as summarized in Table 1.4.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB06T-GRW RB06D-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were a few detections in the rinsate blank (RB). These are summarized in Table 1.5. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
SC-8A-T01N-GRW	0.22 J	---	---	299 J	6.5 J
MMW-43A-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1790 J	6.9 J
EW-5A-T01N-GRW	0.20 UJ	0.005 UJ	0.11 J	1570 J	7.3 J
SC-5B-T01N-GRW	---	---	---	2010 J	7.3 J
SC-2B-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1890 J	6.6 J
RB06T-GRW	0.20 UJ	0.005 UJ	0.01 UJ	0.00 J	6.2 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=10	26.2				21.7	MMW-43A-T01N-GRW	U CCB-I
Boron (P) DF=1	10.6	9.9	29.7	8.42	6.3	SC-8A-T01N-GRW, SC-8A-D01N-GRW, MMW-43A-T01N-GRW, MMW-43A-D01N-GRW, EW-5A-T01N-GRW, EW-5A-D01N-GRW, SC-5B-T01N-GRW, SC-5B-D01N-GRW, SC-2B-T01N-GRW, SC-2B-D01N-GRW	U CCB, MB-I
Molybdenum (MS) DF=2	0.3	0.2			0.2	SC-8A-T01N-GRW, SC-8A-D01N-GRW, MMW-43A-T01N-GRW, MMW-43A-D01N-GRW, SC-2B-T01N-GRW, SC-2B-D01N-GRW	U CCB-I
Zinc (P) DF=10				13.6	1.9	SC-8A-T01N-GRW, SC-8A-D01N-GRW, MMW-43A-T01N-GRW, MMW-43A-D01N-GRW	U MB-I

P = ICP MS = ICP-MS MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit

RL = Reporting Limit DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Dissolved Qualifications for Metals

Sample/ Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
EW-5A-T01N/D01N-GRW				
Nickel	21.3	4.5	Absolute difference <2x RL (9.0)	J TvP-I for samples EW-5A-T01N-GRW and EW-5A-D01N-GRW.

Note: The instrument detection limit (IDL) is used as the reporting limit (RL) for total vs. partial evaluations.

Table 1.4

Total Dissolved Solids Summary

Sample	TDS Measured (mg/L)	TDS Calculated (mg/L)	Ratio of Calculated vs. Measured	Ration Acceptance Range	Qualification Code
RB06T/D-GRW	10	35	3.49	0.5 to 1.5	J TvP-L

Table 1.5
Rinsate Blank Detections

Analytes	RB06T-GRW
Bicarbonate Alkalinity (mg/l)	5.2
Total Alkalinity (mg/l)	5.2
Ammonia (mg/l)	0.074
Sulfate (mg/l)	13.8

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT222A Sampling Event: October 2003 GRW/SFW

Matrix: Solid ___ Water X Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 12/16/03

Peer Reviewer: Stacey Coker Date Completed: 1/13/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
SC-6A-T01N-GRW	SA	548241/117583-01		W	X	X
SC-6A -D01N-GRW	SA	548242		W	X	
SC-3B-T01N-GRW	SA	548243/117583-02		W	X	X
SC-3B-D01N-GRW	SA	548244		W	X	
SC-4A-T01N-GRW	SA	548245/117583-03		W	X	X
SC-4A-D01N-GRW	SA	548246		W	X	
MMW-49A-T01N-GRW	SA	548247/117583-04		W	X	X
MMW-49A-D01N-GRW	SA	548248		W	X	
MMW-38A-T01N-GRW	SA	548249/117583-05		W	X	X
MMW-38A-D01N-GRW	SA	548250		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]The Laboratory IDs include both the IDs for STL-Burlington and STL-Seattle, respectively.

[3]Due to the TKN being subcontracted to STL Seattle some field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

As noted in the case narrative, the TKN analyses by method 351.3 were subcontracted to Severn Trent Laboratories (STL) Seattle, Washington facility. The SDG provided by STL-Seattle was included in its entirety at the end of the STL-Burlington submittal.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The original total dissolved solids (TDS) analysis of sample MMW-38A-T01N-GRW, which was performed within holding time, yielded a net weight after drying that greatly exceeded the upper limit of the method. This sample was re-analyzed , outside of the holding time limit, using a smaller volume yielding results comparable to the original analysis. The results from the re-analysis have been formally presented in this case submittal, with the data from the original analysis being presented in the raw data section of the data package. Also, the original nitrate analysis of sample MMW-38A-T01N-GRW was accomplished within the analytical holding time. However, due to interference related to the sample matrix, this sample was re-analyzed at dilution 6 days beyond holding time. The result from the dilution analysis has been formally presented. For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 15 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum and beryllium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution SC-6A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample SC-6A-T01N-GRW, pH class A, applicable for 1 out of 24 analytes. The result for this one metal was within acceptance limits and data qualification was not necessary. The serial dilution results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples SC-6A-T01N-GRW, SC-6A-D01N-GRW, SC-3B-T01N-GRW, SC-3B-D01N-GRW, SC-4A-T01N-GRW, SC-4A-D01N-GRW, MMW-38A-T01N-GRW, and MMW-38A-D01N-GRW. Therefore, molybdenum and beryllium results for all samples were reported from the trace ICP. The trace ICP molybdenum and beryllium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Tb was high for the ICPMS analysis of samples MMW-38A-T01N-GRW and MMW-38A-D01N-GRW. Therefore, antimony, barium, and cadmium results for all samples were reported from the trace ICP. The trace ICP antimony, barium, and cadmium reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any site-specific field quality control samples. The field quality control results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Conductivity (umhos/cm)	pH
SC-6A-T01N-GRW	---	---	---	---	2180 J	3.6 J
SC-3B-T01N-GRW	0.2 UJ	---	0.01 UJ	---	2280 J	5.9 J
SC-4A-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	---	2070 J	4.1 J
MMW-49A-T01N-GRW	2.8 J	0.005 UJ	0.025 J	---	1330 J	4.3 J
MMW-38A-T01N-GRW	0.40 UJ	0.0083 J	0.015 J	11400 J	6710 J	3.1 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=100	23.4			21.7	SC-3B-T01N-GRW, SC-3B-D01N-GRW	U CCB-I
Beryllium (P) DF=10		-0.5	-0.492	0.4	SC-4A-D01N-GRW	J CCB-L

P = ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT223A Sampling Event: October 2003 GRW/SFW

Matrix: Solid ____ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 12/15/03

Peer Reviewer: Stacey Coker Date Completed: 1/13/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
MMW-33A-T01N-GRW	SA	548394/117586-01		W	X	X
MMW-33A-D01N-GRW	SA	548395		W	X	
MMW-10A-T01N-GRW	SA	548396/111586-02		W	X	X
MMW-10A-D01N-GRW	SA	548397		W	X	
MMW-28A-T01N-GRW	SA	548398/117586-03		W	X	X
MMW-28A-D01N-GRW	SA	548399		W	X	
AWWT-1-T01N-GRW	SA	548400/117586-04		W	X	X
AWWT-1-D01N-GRW	SA	548401		W	X	
MMW-29A-T01N-GRW	SA	548402/117586-05		W	X	X
MMW-29A-D01N-GRW	SA	548403		W	X	
MMW-29A-T01D-GRW	FD	548404/117586-06		W	X	X
MMW-29A-D01D-GRW	FD	548405		W	X	
LA BOBITA-T01N-GRW	SA	548406/117586-07	LABOBITA-T01N-GRW	W	X	X
LA BOBITA-D01N-GRW	SA	548407	LABOBITA-D01N-GRW	W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]The Laboratory IDs include both the IDs for STL-Burlington and STL-Seattle, respectively.

[3]Due to the TKN being subcontracted to STL Seattle some field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

The TKN analyses by method 351.3 were subcontracted to Severn Trent Laboratories (STL) Seattle, Washington facility. The SDG provided by STL-Seattle was included in its entirety at the end of the STL-Burlington submittal.

During the metals analyses of the samples in this SDG, the linear range verification standard yielded percent recoveries for aluminum, potassium, and sodium that were slightly below control criteria. The concentrations of these elements in the associated field samples were well below this standard and the on-instrument concentrations were in the lower end of the calibration range.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The analysis for pH and conductivity were exceeded by 2 and 15 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, beryllium, chromium, copper, iron, sodium, and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-33A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample MMW-33A-T01N-GRW, pH class A, applicable for 1 out of 24 analytes. The result for this one metal was within acceptance limits and data qualification was not necessary. The serial dilution results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For sample LA BOBITA-T01N/D01N-GRW the analysis of dissolved zinc exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.3 summarizes these results and the data qualification. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exception of MMW-28A-T01N/D01N-GRW (13.69%), which agrees with the recalculated cation/ anion balance. Four of the cation concentrations contributing to the calculation of this balance (Ca^{2+}, K^{+}, Na^{+}, and Al^{3+}) were not detected above the instrument detection limit (IDL) and were therefore reported at the detection limit. Recalculation of the balance, using ½ the concentration for Ca^{2+}, which contributed significantly to this balance (25%meq/L), resulted in a cation/anion balance of -0.29%. The concentrations were low enough that reporting limits controlled the calculations. The balances were therefore not an appropriate measure of accuracy. No qualification was considered necessary.
Field QC • Field Duplicate (FD) MMW-29A-T01D-GRW MMW-29A-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package included one set of field duplicate samples. The field duplicate results satisfied the evaluation criteria in SOP 12.1. The field quality control results for the October 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH
MMW-33A-T01N-GRW	1480 J	4.4 J
MMW-10A-T01N-GRW	2010 J	4.4 J
MMW-28A-T01N-GRW	758 J	6.0 J
AWWT-1-T01N-GRW	1280 J	4.1 J
MMW-29A-T01N-GRW	1190 J	4.7 J
MMW-29A-T01D-GRW	1240 J	4.8 J
LA BOBITA-T01N-GRW	830 J	4.6 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=100 12/7/03			44.6	52.8	67.2		22.1	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-29A-T01N-GRW, MMW-29A-D01N-GRW, MMW-29A-T01D-GRW, MMW-29A-D01D-GRW, LA BOBITA-T01N-GRW, LA BOBITA-D01N-GRW	U CCB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=10 12/7/03	0.5	0.8	0.6				0.4	MMW-33A-D01N-GRW, MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, AWWT-1-T01N-GRW, AWWT-1-D01N-GRW, MMW-29A-T01N-GRW, MMW-29A-D01N-GRW, MMW-29A-T01D-GRW, MMW-29A-D01D-GRW LA BOBITA-T01N-GRW, LA BOBITA-D01N-GRW	U CCB-I
Chromium (P) DF=100 12/7/03						1.611	1.1	MMW-33A-D01N-GRW, MMW-10A-T01N-GRW, MMW-28A-T01N-GRW, AWWT-1-T01N-GRW, AWWT-1-D01N-GRW, MMW-29A-D01N-GRW, MMW-29A-D01D-GRW, LA BOBITA-T01N-GRW, LA BOBITA-D01N-GRW	U MB-I
Copper (P) DF=100 12/7/03			-3.0	-2.2	-2.2		2.2	MMW-33A-D01N-GRW, MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, AWWT-1-T01N-GRW, AWWT-1-D01N-GRW, MMW-29A-T01N-GRW, MMW-29A-D01N-GRW, MMW-29A-T01D-GRW, MMW-29A-D01D-GRW LA BOBITA-T01N-GRW, LA BOBITA-D01N-GRW	UJ/J CCB-L
Iron (P) DF=100 12/7/03					35.6	34.33	27.8	MMW-33A-D01N-GRW, MMW-10A-T01N-GRW, MMW-28A-T01N-GRW	U MB-I
								MMW-29A-D01D-GRW, LA BOBITA-T01N-GRW, LA BOBITA-D01N-GRW	U MB, CCB-I
Sodium (P) DF=100 12/7/03			681.1	661.8		774.3	453.8	MMW-33A-D01N-GRW, MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, MMW-28A-T01N-GRW, AWWT-1-T01N-GRW, AWWT-1-D01N-GRW, MMW-29A-T01N-GRW, MWW-29A-D01N-GRW, MMW-29A-T01D-GRW	U CCB, MB-I
								MMW-29A-D01D-GRW, LA BOBITA-T01N-GRW, LA BOBITA-D01N-GRW	U MB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Zinc (P) DF=100 12/7/03						5.988	2.3	MMW-28A-T01N-GRW, AWWT-T01N-GRW, AWWT-D01N-GRW, LA BOBITA-T01N-GRW, LA BOBITA-D01N-GRW	U MB-I

P = ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Dissolved Qualifications for Metals

Sample/Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
LA BOBITA-T01N/D01N-GRW				
Zinc	670	230	Absolute difference <2x RL (460)	J TvP-I for samples LABOBITA-T01N-GRW and LA BOBITA-D01N-GRW.

Note: The instrument detection limit (IDL) is used as the reporting limit (RL) for total vs. partial evaluations.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT224A

Sampling Event: October 2003 Groundwater

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Ansley Watson

Date Completed: 1/5/04

Peer Reviewer: Stacey Coker

Date Completed: 1/12/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses	
					Metals	Inorganic
CC1A-T01N-GRW	SA	548408		W	X	X
CC1A-D01N-GRW	SA	548409		W	X	
CC1B-T01N-GRW	SA	548410/117587-1		W	X	X
CC1B-D01N-GRW	SA	548411		W	X	
AWWT-2-T01N-GRW	SA	548412/117587-2		W	X	X
AWWT-2-D01N-GRW	SA	548413		W	X	
CC2A-T01N-GRW	SA	548414/117587-3		W	X	X
CC2A-D01N-GRW	SA	548415		W	X	
CC2B-T01N-GRW	SA	548416/117587-4		W	X	X
CC2B-D01N-GRW	SA	548417		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]The Laboratory IDs include both the IDs for STL-Burlington and STL-Seattle, respectively.

[3]Due to the TKN being subcontracted to STL Seattle some field IDs were abbreviated. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

As noted in the case narrative, the TKN analyses by method 351.3 were subcontracted to Severn Trent Laboratories (STL) Seattle, Washington facility. The SDG provided by STL-Seattle was included in its entirety at the end of the STL-Burlington submittal.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Several inorganic analyses were unable to be analyzed for sample CC1A-T01N-GRW, due to a limited amount of sample produced from that well and given to the laboratory for analysis.
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 15 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Beryllium, chromium, nickel, and potassium were detected in the method blank. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution CC1A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample CC1A-T01N-GRW, pH class C, applicable for 0 out of 24 analytes. The result for this one metal was within acceptance limits and data qualification was not necessary. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples CC2A-T01N-GRW, and CC2A-D01N-GRW. Therefore, molybdenum and beryllium results for all samples were reported from the trace ICP. The trace ICP molybdenum and beryllium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any site-specific field quality control samples. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Review Parameter	Criteria Met?	Comments
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
CC1A-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	498 J	6.9 J
CC1B-T01N-GRW	0.20 UJ	---	---	540 J	7.1 J
AWWT-2-T01N-GRW	0.20 UJ	---	---	2520 J	6.9 J
CC2A-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1180 J	6.5 J
CC2B-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1510 J	6.9 J

--- = Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=1		-0.5		-0.492	0.4	CC1A-T01N-GRW, CC1A-D01N-GRW, CC1B-T01N-GRW, CC1B-D01N-GRW, CC2B-T01N-GRW, CC2B-D01N-GRW	UJ/J CCB, MB-L
Chromium (P) DF=1	-1.7	-2.0		-1.337	1.1	All samples in this SDG.	UJ/J CCB, MB-L
Nickel (P) DF=1	-5.8	-6.1	-5.4	-5.396	2.4	CC1A-T01N-GRW, CC1A-D01N-GRW, CC1B-T01N-GRW, CC1B-D01N-GRW, CC2A-T01N-GRW, CC2A-D01N-GRW, CC2B-T01N-GRW, CC2B-D01N-GRW	UJ/J CCB, MB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Potassium (P) DF=1	539.9	1117	911.6	1059	318	CC1A-T01N-GRW, CC1A-D01N-GRW, CC1B-T01N-GRW, CC1B-D01N-GRW, AWWT-2-T01N-GRW, AWWT-2-D01N-GRW	U CCB, MB-I

P = ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: US2RA Sampling Event: October 2003 GRW

Matrix: Solid ___Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 12/11/03

Peer Reviewer: Stacey Coker Date Completed: 12/12/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Laboratory Form Field ID Abbreviation [2]	Matrix	Analyses
					Metals
US-2-T01N-GRW	SA	553550		W	X
US-2-D01N-GRW	SA	553551		W	X

Matrix: S = Solid W = Water B = Biota
QC Type: SA = Sample

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

As noted in the case narrative, the enclosed submittal contains the analytical results from the metals re-analysis of samples US-2-T01N-GRW and US-2-D01N-GRW from October 2003 groundwater sampling event. These samples were re-analyzed using the class C dilution protocol. This sample was originally analyzed using the class A dilution protocol per the chain of custody documentation and reported in WAT201A.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The sample handling documentation is covered in the original WAT201A SDG.
Holding Times	Yes	
Laboratory Blank Results	No	Aluminum, antimony, iron, manganese, potassium, and zinc were detected in various blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD/PDS LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution US-2-T01N-GRWL Internal Standards Total vs. Partial Analyses Cation/Anion Balance	Yes	The serial dilution analysis was conducted on sample US-2-T01N-GRWL, pH class C, and was applicable for 0 out of 24 analytes. The serial dilution results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. For sample US-2-T01N/D01N-GRW the analysis of dissolved copper exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.2 summarizes these results and the data qualification.
Field QC Field Duplicate (FD) Rinsate Blank (RB) Field Blank (FB) Trip Blank (TB) Other (e.g., splits)	No	This package did not include any field quality control samples. The field quality control results for the October 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1

Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB4 µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=10					-49.0	30.7	US-2-T01N-GRW, US-2-D01N-GRW	UJ MB-L
Antimony (MS) DF=2			0.7	0.7		0.5	US-2-T01N-GRW	U CCB-I
Iron (P) DF=10		-32.9			-41.51	30.0	US-2-T01N-GRW, US-2-D01N-GRW	UJ CCB, MB-L
Manganese (P) DF=10	-1.2	-1.2			-1.074	1.0	US-2-T01N-GRW, US-2-D01N-GRW	UJ CCB, MB-L
Potassium (P) DF=1		969.8				521.7	US-2-T01N-GRW, US-2-D01N-GRW	U CCB-I
Zinc (P) DF=10					9.022	2.0	US-2-D01N-GRW	U MB-I

P=ICP MB=method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit RL= Reporting Limit

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.2

Total vs. Dissolved Qualifications for Metals

Sample/Analytes	Absolute difference	RL (µg/l)	Evaluation Criteria	Action
US-2-T01N/D01N-GRW				
Copper	6.2	2.0	Absolute difference <2x RL (4.0)	J TvP-I for samples US-2-T01N-GRW and US-2-D01N-GRW.
Zinc	88.9	20	Absolute difference <2x RL (40)	J TvP-I for samples US-2-T01N-GRW and US-2-D01N-GRW.

Note: The instrument detection limit (IDL) is used as the reporting limit (RL) for total vs. partial evaluations.

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE NOVEMBER 2003 GROUNDWATER AND SURFACE WATER SAMPLING EVENT

Prepared for
Molycorp, Inc.
Questa, New Mexico

March 2004

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Project No. 22236241.00100

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Dilution Schemes/Non-Detects With Elevated RLs 3-1
3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 3-1
3.2.3 Non-Valid Matrix Spikes 3-2
3.2.4 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Summary/Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.1.1 Groundwater Matrix Spike 4-2
4.1.2 Surface Water Matrix Spike 4-3
4.1.3 Post-Digestion Spikes 4-4
4.2 Laboratory Duplicates (Precision Evaluation) 4-4
4.2.1 Groundwater Laboratory Duplicate 4-4
4.2.2 Surface Water Laboratory Duplicate 4-5
4.3 Serial Dilution Results 4-5
4.3.1 Groundwater Serial Dilutions 4-5
4.3.2 Surface Water Serial Dilutions 4-6

Section 5 Collective Summary/Assessment of Field QC Results 5-1

5.1 Field Duplicate Samples 5-1
5.1.1 Groundwater Field Duplicate Results 5-2
5.1.2 Surface Water Field Duplicates Results 5-2
5.2 Rinsate Blank Results 5-2
5.2.1 Groundwater Rinsate Blanks 5-3
5.2.2 Surface Water Rinsate Blanks 5-4
5.3 Field Blank Results 5-5

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-2
6.4 Representativeness 6-2
6.5 Comparability 6-2
6.6 Sensitivity 6-3

TABLE OF CONTENTS

List of Tables

Table 1-1 Summary of Groundwater Samples Collected During November, 2003 Sampling Event

Table 1-2 Summary of Surface Water Samples Collected During November, 2003 Sampling Event

Table 4-1 Field Samples Submitted for Matrix Spike

Table 4-2 Count of Matrix Spike Samples Collected in November, 2003 Sampling Event

Table 4-3 Inorganic Matrix Spike Results for Groundwater Samples

Table 4-4 Inorganic Matrix Spike Results for Surface Water Samples

Table 4-5 Inorganic Laboratory Duplicate Exceedances for Groundwater Samples

Table 4-6 ICP Serial Dilution Exceedances for Groundwater Samples

Table 4-7 ICP Serial Dilution Exceedances for Surface Water Samples

Table 5-1 Summary of Field Duplicate Water Samples Collected Summer 2003

Table 5-2 Field Duplicate Collection Frequency for the November, 2003 Sampling Event

Table 5-3 Field Duplicate Exceedances for Surface Water Samples

Table 5-4 Rinsate Blanks Collected During the November, 2003 Sampling Event

Table 5-5 Rinsate Blank Collection Frequency for the November, 2003 Sampling Event

Table 5-6 Summary of Groundwater Rinsate Blank Results and Additional Qualifications

Table 5-7 Summary of Surface Water Rinsate Blank Results and Additional Qualifications

Table 6-1 Summary of Precision Assessment for November 2003

Table 6-2 Summary of Accuracy Assessment for November 2003

TABLE OF CONTENTS

List of Attachments

Attachment 1.1 Data Package WAT225C

Attachment 1.2 Data Package WAT226C

Attachment 1.3 Data Package WAT227A

Attachment 1.4 Data Package WAT228S

Attachment 1.5 Data Package WAT229C

Attachment 1.6 Data Package WAT230A

Attachment 1.7 Data Package WAT231C

This Data Validation Report (DVR) provides a general overview of the usability of chemical data obtained from the November 2003 sampling activities at Molycorp. In addition, this data validation report is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

This report contains the results of the data validation conducted for groundwater and surface water samples collected in November of 2003 at the Molycorp Questa Mine, Questa, New Mexico. These water samples were collected in support of the Remedial Investigation/Feasibility Study (RI/FS). The water samples were sent to Severn Trent Laboratories (STL) Burlington in Colchester, VT. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods used and quality control samples collected were in accordance with the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). The results were reported in seven original data packages.

The groundwater and surface water samples collected during the November 2003 sampling event and their associated chemical analyses are summarized in Tables 1.1 and 1.2, respectively. Included in these tables is the frequency of QC samples collected for each matrix.

Table 1-1
Summary of Groundwater Samples Collected
During November, 2003 Sampling Event

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganics
MW-20-T01N-GRW (WAT225C)	X	X	X
MW-21-T01N-GRW (WAT225C)	X	X	X
MW-22-T01N-GRW (WAT225C)	X	X	X
MW-23-T01N-GRW (WAT225C)	X	X	X
MW-25-T01N-GRW (WAT225C)	X	X	X
MW-26-T01N-GRW (WAT225C)	X	X	X
MW-1-T01N-GRW (WAT225C)	X, MS	X, MS	X, MS
MW-17-T01N-GRW (WAT225C)	X	X	X
MW-24-T01N-GRW (WAT225C)	X	X	X
MW-28-T01N-GRW (WAT225C)	X	X	X
MW-27-T01N-GRW (WAT226C)	X	X	X
MW-29-T01N-GRW (WAT226C)	X, FD	X, FD	X, FD
MW-9A-T01N-GRW (WAT226C)	X, RB	X, RB	X, RB
MMW-47A-T01N-GRW (WAT227A)	X	X	X
MMW-45A-T01N-GRW (WAT227A)	X, FD	X, FD	X, FD
MMW-29A-T01N-GRW (WAT227A)	X, MS	X, MS	X, MS
SPRING 13-T01N-GRW (WAT227A)	X	X	X
LOWER SPRING 13-T01N-GRW (WAT227A)	X	X	X
MMW-49A-T01N-GRW (WAT227A)	X	X	X
MMW-45B-T01N-GRW (WAT227A)	X	X	X
MMW-33A-T01N-GRW (WAT227A)	X	X	X
MMW-48A-T01N-GRW (WAT227A)	X	X	X
MMW-28A-T01N-GRW (WAT229C)	X	X	X
MMW-44B-T01N-GRW (WAT229C)	X, RB	X, RB	X, RB
MMW-31B-T01N-GRW (WAT229C)	X, RB	X, RB	X, RB
SPRING 39 PUMP-T01N-GRW (WAT230A)	X, MS	X, MS	X, MS

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganics
MMW-10A-T01N-GRW (WAT230A)	X	X	X
GWW-1-T01N-GRW (WAT230A)	X	X	X
GWW-2-T01N-GRW (WAT230A)	X	X	X
SPRING 13 PUMP-T01N-GRW (WAT230A)	X	X	X
GWW-3-T01N-GRW (WAT230A)	X, FD	X, FD	X, FD
MMW-17A-T01N-GRW (WAT230A)	X	X	X
MMW-17B-T01N-GRW (WAT230A)	X	X	X
MMW-44A-T01N-GRW (WAT230A)	X	X	X
MMW-42B-T01N-GRW (WAT231C)	X	X	X
CC2B-T01N-GRW (WAT231C)	X	X	X
CC1A-T01N-GRW (WAT231C)	X	X	X
CC1B-T01N-GRW (WAT231C)	X	X	X
CC2A-T01N-GRW (WAT231C)	X	X	X
MMW-2-T01N-GRW (WAT231C)	X	X	X
MMW-3-T01N-GRW (WAT231C)	X	X	X
DP-1-T01N-GRW (WAT231C)	X	X	X
DP-2-T01N-GRW (WAT231C)	X	X	X
DP-3-T01N-GRW (WAT231C)	X	X	X
Number GW samples	44	44	44
Number MS/MSD or MS/LD	3	3	3
Number Field Duplicates	3	3	3
Number Rinsate Blanks	3	3	3
Number Field Blanks	NA	NA	NA

NS = Not Sampled MS = Matrix Spike NA= Not Applicable

RB = Rinsate Blank FD = Field Duplicate FB = Field Blank GRW- Groundwater

[1] For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N."

Table 1-2
Summary of Surface Water Samples Collected
During November, 2003 Sampling Event

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics
RR-DSSPRING13-T01N-SFW (WAT228S)	X, FD	X, FD	X, FD
RR-DSSPRING39-T01N-SFW (WAT228S)	X	X	X
RR-USSPRING13-T01N-SFW (WAT228S)	X, MS	X, MS	X, MS
RR-USSPRING39-T01N-SFW (WAT228S)	X, RB	X, RB	X, RB
LR-6-T01N-SFW (WAT228S)	X	X	X
LR-4-T01N-SFW (WAT228S)	X	X	X
Number SW samples	6	6	6
Number MS/MSD or MS/LD	1	1	1
Number Field Duplicates	1	1	1
Number Rinsate Blanks	1	1	1
Number Field Blanks	NA	NA	NA

NS = Not Sampled DS = Downstream US = Upstream

FB = Field Blank MS/MSD = Matrix Spike/Matrix Spike Duplicate

RB = Rinsate Blank FD = Field Duplicate SFW= Surface water

[1] For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N."

The QAPP required that the quality control samples listed above be collected at a frequency of 5%. As illustrated by the tables above, the required frequency of QC analyses was satisfied for each analysis type.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, Inductively Coupled Plasma (ICP) Spectroscopy serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, rinsate blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Section 3.0 includes the data review narratives for each of the data packages. In all cases of professional judgment exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative.

After completing the review sample-specific and laboratory performance parameters in accordance with SOP 12.1, the site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. The reason for this is that site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (matrix spike, lab duplicate, and serial dilution results) and associated sample qualification. Where applicable, the potential direction of bias (high, low, or indeterminate) has been identified and noted on the sample results sheets as H, L, or I, respectively. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 6.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for the data packages included in this event. In order to attain the frequency requirements for laboratory performance reviews, one data package (WAT225C) was evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identified whether findings globally affect all relevant water samples analyzed for the November 2003 Groundwater and Surface Water Sampling Event. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

3.2.1 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

3.2.3 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.4 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL data package WAT225C was used to evaluate laboratory performance criteria. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. If data qualification was required due to a specific laboratory performance parameter, the parameter must be evaluated in all packages for the event. The laboratory performance parameters evaluated were found to be acceptable and no additional packages for this event were required to be assessed for performance parameters.

The site-specific matrix spike (MS) results, laboratory duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analysis, LD analyses, and the serial dilution results with the samples collected during the November, 2003 sampling event.

Additional aliquots of two groundwater samples and one surface water sample were submitted for use in matrix QC analyses. Table 4.1a below summarizes the site-samples that were used to prepare MS samples.

Table 4-1
Field Samples Submitted for Matrix Spike

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics
MW-1-T01N-GRW	Groundwater	WAT225C	x	x	x
MMW-29A-T01N-GRW	Groundwater	WAT227A	x	x	x
RR-US-SPRING 13-T01N-SFW	Surface water	WAT228S	x	x	x
SPRING 39 PUMP-T01N-GRW	Groundwater	WAT230A	x	x	x

[1]For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

Table 4-2 lists the groundwater and surface water MS sample sets relative to the number of field samples.

Table 4-2
Count of Matrix Spike Samples Collected in November, 2003 Sampling Event

Analyses	Number of MS samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	3	44	7
Dissolved Metals	3	44	7
Inorganics	3	44	7
Surface Water			
Total Metals	1	6	15
Dissolved Metals	1	6	15
Inorganics	1	6	15

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results. A number of spike recoveries were outside of the QC acceptance limits of 75-125% for both inorganics and metals. In general, if less than a quarter of

the valid spike recoveries (i.e., the sample concentration was no greater than four times the spike added) for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

4.1.1 Groundwater Matrix Spike

Although the majority of the groundwater matrix spike recoveries were within acceptance limits, some exceedances were observed. Table 4-3 summarize the inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added), and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 4-3
Inorganics Matrix Spike Results for Groundwater Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Total Metals					
Aluminum	2	0	**1**	**126.7**	J MS-H, all positive results
Antimony	3	0	0	109.1	
Arsenic	3	**1**	0	87.5	J/UJ MS-L, parent only
Barium	3	0	0	100.9	
Beryllium	3	0	0	102.7	
Boron	3	0	0	103.8	
Cadmium	3	0	**2**	121.6	J MS-H, all positive results
Chromium	3	**1**	0	**69.1**	R, nondetect parent result only[1]
Cobalt	3	0	0	106.9	
Copper	3	0	0	106.5	
Iron	0	0	0	**NA**	
Lead	3	0	0	111.2	
Manganese	2	**1**	0	89.0	J/UJ MS-L, all results
Mercury	3	0	0	98.8	
Molybdenum	3	0	0	102.5	
Selenium	3	0	0	91.5	
Nickel	3	0	**1**	115.4	J MS-H positive result, parent only
Thallium	3	0	0	113.2	
Silver	3	0	0	112.1	
Vanadium	3	0	0	105.7	
Zinc	3	0	0	106.9	
Dissolved Metals					
Aluminum	1	0	0	106.7	
Antimony	3	0	0	107.7	
Arsenic	3	**1**	0	89.2	J/UJ MS-L, parent only
Barium	3	0	0	101.0	
Beryllium	3	0	0	107.0	
Boron	3	0	0	104.3	
Cadmium	3	0	**1**	118.3	J MS-H positive result, parent only

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Chromium	2	**1**	0	**74.2**	R, nondetect parent result only
Cobalt	3	0	0	109.3	
Copper	3	0	**1**	115.2	J MS-H positive result, parent only[1]
Iron	1	0	0	117.0	
Lead	3	0	0	113.4	
Manganese	2	0	0	105.2	
Mercury	3	0	0	94.0	
Molybdenum	3	0	0	101.7	
Selenium	3	0	0	90.3	
Nickel	3	0	**1**	116.2	J MS-H positive result, parent only
Thallium	3	0	0	110.2	
Silver	3	0	0	108.7	
Vanadium	3	0	0	106.0	
Zinc	3	0	**1**	**128.4**	J MS-H, positive result, parent only
Inorganics[2]					
Chloride	3	0	0	100.9	
Cyanide	3	**1**	0	77.2	J/UJ MS-L, parent only
Nitrate	3	0	0	109.0	
Total ALK	1	0	0	102.0	
Fluoride	3	0	0	104.0	
Ammonia	3	**1**	0	77.5	J/UJ MS-L, parent only
TKN	3	0	0	86.7	
Nitrite	3	0	0	101.6	
Ortho-P	3	0	0	94.6	
Phosphorus	3	0	0	97.5	
Sulfate	3	0	0	83.2	
TOC	3	**1**	0	80.0	J/UJ MS-L, parent only

[1] Laboratory spiking concentration was above applicable levels. Therefore, recovery data were not used to assess the accuracy of the remaining sample results.

[2] MS recoveries for the bicarbonate and total alkalinity analyses are not an appropriate measure of accuracy due to the highly variable pH range (see Section 3.2.2). Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not used to assess the accuracy of the analysis.

For a few of the analytes listed in the table above, it was considered necessary to extend qualification to the balance of the November 2003 groundwater samples because more than a quarter of the spike results were outside evaluation criteria. The vast majority (>97%) of matrix spike results were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

4.1.2 Surface Water Matrix Spike

Although the majority of the surface water matrix spike recoveries were within acceptance limits, exceedances were observed. All MS recoveries met criteria for total and dissolved metals. Table 4-4 summarize the inorganics MS results exceeding criteria, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 4-4
Inorganics Matrix Spike Results for Surface Water Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Inorganics					
Ammonia	1	1	0	71.2	J/UJ MS-L for all sample results
Sulfate	1	1	0	15	R/J MS-L for all sample results

For each of the analytes listed in the table above, it was considered necessary to extend qualification to the balance of the November 2003 surface water samples due to the small data set and the magnitude of the exceedances. Although results for some analytes were qualified based on matrix spike recoveries, only sulfate warranted rejection for all nondetect surface water results. The vast majority (>97%) of matrix spike results were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

4.1.3 Post-Digestion Spikes

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the matrix spike exceedances were the result of sample matrix, and/or due to a bias in the analytical system. Recoveries for nearly all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

4.2 LABORATORY DUPLICATES (PRECISION EVALUATION)

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion of ≤20% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

4.2.1 Groundwater Laboratory Duplicate

Most laboratory duplicate results were within the laboratory acceptance limits. Table 4-5 below lists the groundwater laboratory duplicate results exceeding criteria and the result qualifiers applied.

Table 4-5
Inorganic Laboratory Duplicate Exceedances for Groundwater Samples

Analyte (20% or 1xRL)	Sample ID	RPD or Difference	Frequency of Limit Exceedance	Action
Metals All results were within criteria				
Inorganics				
Phosphorous	SPRING 39 PUMP-T01N-GRW	ABS.= 0.013	1 of 3	J D-I for parent sample results.

The laboratory duplicate results indicate overall acceptable precision. Only the phosphorous result for the parent sample SPRING 39 PUMP-T01N-GRW was qualified as estimated on the basis of laboratory duplicate results.

4.2.2 Surface Water Laboratory Duplicate

All of the surface water laboratory duplicate recoveries were within the laboratory acceptance limits.

4.3 SERIAL DILUTION RESULTS

ICP serial dilutions are analyzed to help evaluate whether or not interferences exist due to sample matrix. When analyte concentrations are sufficiently high (defined as minimally 50x greater than the instrument detection limit [IDL]), the original results and five fold dilution are expected to agree within 10%. Otherwise interferences resulting in signal suppression or enhancement might be suspected.

The original and diluted sample results are compared by a percent difference (%D). When %Ds of ≤10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate than the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result.

4.3.1 Groundwater Serial Dilutions

Table 4-6 lists the number of applicable groundwater serial dilution results for analytes that exceeded criteria. With the exceptions noted in the table, all remaining %Ds between the original sample results and the result obtained from a five-fold diluted sample were ≤10%.

Table 4-6
ICP Serial Dilution Exceedances for Groundwater Samples

Analyte	Number of Serial Dilution samples analyzed	Number of Valid Results	%Ds >10%	Avg. %Ds	Potential Bias Direction		Action
					Low	High	
Total Antimony	6	1	1	16.6	1	0	J/UJ DL-L, parent (MW-1) results only
Dissolved Antimony	3	1	1	17.7	1	0	
Total Arsenic	6	1	1	12.0	1	0	J/UJ DL-L, parent (MW-1) results only
Dissolved Arsenic	3	1	1	12.5	1	0	
Total Lead	6	1	1	11.8	1	0	J/UJ DL-L, parent (MW-1) results only
Dissolved Lead	3	1	1	17.5	1	0	
Total Thallium	6	1	1	14.7	1	0	J/UJ DL-L, parent (MW-1) results only
Dissolved Thallium	3	1	1	18.6	1	0	
Total Silver	6	1	1	12.1	1	0	J/UJ DL-L, parent (MW-1) results only
Dissolved Silver	3	1	1	13.5	1	0	
Total Vanadium	6	1	1	13.6	1	0	J/UJ DL-L, parent (MW-1) results only
Dissolved Vanadium	3	1	1	14.9	1	0	
Dissolved Molybdenum	3	1	1	4.1	1	0	J/UJ DL-L, parent (SPRING 39 PUMP-D01N-GRW) results only

MW-1-T01N-GRW and MW-1-D01N-GRW results for antimony, arsenic, lead, thallium, silver, and vanadium exhibited valid serial dilution results outside QC acceptance limits. SPRING 39 PUMP-D01N-GRW results for dissolved molybdenum also exceeded criteria. Data qualification was issued to only the parent samples because there was only one valid result out of six for the total samples and out of three for the dissolved samples. The parent sample results were qualified as estimated with a potential low bias (J DL-L).

4.3.2 Surface Water Serial Dilutions

Table 4-7 the number of applicable groundwater serial dilution results for analytes that exceeded criteria. With the exceptions noted in the table, all remaining %Ds between the original sample results and the result obtained from a five-fold diluted sample were ≤10%.

Table 4-7
ICP Serial Dilution Exceedances for Surface Water Samples

Analyte	Number of Serial Dilution samples analyzed	Number of Valid Results	%Ds >10%	Avg. %Ds	Potential Bias Direction		Action
					Low	High	
Total Selenium	1	1	1	15.6	1	0	J DL-L, parent (RR-US-SPRING 13-T01N-SFW) results only
Dissolved Cadmium	1	1	1	11.8	1	0	J DL-L, parent (RR-US-SPRING 13-D01N-SFW) results only

[1] The table is limited to analytes for which the serial dilution results were

Data qualification was issued to sample RR-US-SPRING 13-T01N-SFW for selenium and sample RR-US-SPRING 13-D01N-SFW for cadmium because there was only one valid detect for the total and dissolved results. The respective parent sample results were qualified as estimated with a potential low bias (J DL-L).

The site-specific blanks (field and rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. Field duplicate agreement was assessed to determine the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. The following sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

5.1 FIELD DUPLICATE SAMPLES

Four field duplicate sample pairs were collected during this sampling event. The field duplicate pairs and frequencies are listed in the Table 5-1 and 5-2 below. As there were 44 and six groundwater and surface water samples respectively, the frequency of field duplicate collection satisfied the QAPP requirement of 5%.

Table 5-1
Summary of Field Duplicate Water Samples Collected Summer 2003

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics
RR-DS-SPRING-13-T01N-SFW/ RR-DS-SPRING-13-T01D-SFW	Surface Water	WAT228S	x	x	x
MW-29-T01N-GRW/ MW-29-T01D-GRW	Groundwater	WAT226C	x	x	x
MMW-45A-T01N-GRW/ MMW-45A-T01D-GRW	Groundwater	WAT227A	x	x	x
GWW-3-T01N-GRW/GWW-3-T01D-GRW	Groundwater	WAT230A	x	x	x

1. For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

Table 5-2
Field Duplicate Collection Frequency for the November, 2003 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	3	44	7
Dissolved Metals	3	44	7
Inorganics	3	44	7
SURFACE WATER			
Total Metals	1	6	15
Dissolved Metals	1	6	15
Inorganics	1	6	15

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion of ≤25% was applied for cases in which both the sample and sample duplicate concentration were greater than two times the RL as the reporting limit. For field duplicate pairs where the sample or duplicate concentration was less than five times the reporting limits, the absolute difference between the sample and duplicate was compared to the criterion of two times the greater RL

(EQL). With few exceptions, the applicable evaluation criterion was met. The exceptions and the resultant data qualifiers are summarized in the table below.

5.1.1 Groundwater Field Duplicate Results

All field duplicate results were within evaluation criteria for groundwater samples, therefore, no qualifications of data were necessary.

5.1.2 Surface Water Field Duplicates Results

The surface water field duplicate sample results did not meeting acceptance criteria and resultant data qualification issued is summarized in Table 5-3 below.

Table 5-3
Field Duplicate Exceedances for Surface Water Samples

Sample ID	Analyte	RPD or Difference	Comment	Action
Metals				
RR-DS-SPRING 13-T01N-SFW RR-DS-SPRING 13-T01D-SFW	Dissolved Aluminum	RPD=41.2%	1 out of 1	J/UJ FD-I for parent sample
	Dissolved Iron	ABS=257.3 (µg/L)	1 out of 1	J/UJ FD-I for parent sample
Inorganics All results were within criteria				

Data qualification for dissolved aluminum and iron was limited to the parent samples only because of the relatively minimal frequency (one pair) and magnitude of the exceedances. The dissolved parent sample results were qualified as estimated with an indeterminate bias (J FD-I).

Although some results were qualified based on field duplicate agreement, the vast majority (>99%) of the field duplicate results were within limits.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blanks are prepared in an identical manner to the samples with which they are associated. Tables 5-2 and 5-3 summarize the rinsate blank samples associated with the samples collected during the November 2003 Groundwater and Surface water sampling event. The QAPP required frequency of 5% for the collection of rinsate blanks was met for the November 2003 sampling event.

Table 5-4
Rinsate Blanks Collected During the November, 2003 Sampling Event

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics
RB01T-GRW	Groundwater	WAT229C	x	x	x
RB02T-GRW	Groundwater	WAT229C	x	x	x
RB03T-SFW	Groundwater	WAT226A	x	x	x
RB01T-SFW	Surface water	WAT228S	x	x	x

[1] The "T" in the field ID was changed to "D" for dissolved metals samples.

Table 5-5
Rinsate Blank Collection Frequency for the November, 2003 Sampling Event

Analyses	Number of RB Samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	3	44	7
Dissolved Metals	3	44	7
Inorganics	3	44	7
Surface Water			
Total Metals	1	6	15
Dissolved Metals	1	6	15
Inorganics	1	6	15

The rinsate blank detections results for groundwater and surface water and the resulting data qualification issued are summarized in Tables 5-6 and 5-7, respectively. To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result which might bias the average low or biasing the average high by using the reporting limit.

5.2.1 Groundwater Rinsate Blanks

Table 5-6 summarizes the analytes detected in the associated RI/FS groundwater rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 5-6
Summary of Groundwater Rinsate Blank Results and Additional Qualifications

Analyte	Sample ID	Conc.	Avg. Conc.	RL	Frequency of Detection	Range for Field Samples	Action[1]
Metals (ug/l)							
Zinc	RB03T-GRW	24.7	14.6	19.0	1 of 3	19-9000	All total zinc results <73.0 mg/L were qualified as nondetect (U RB-I).
Dissolved Metals (ug/l)							
Zinc	RB03D-GRW	20.9	13.3	19.0	1 of 3	19-11300	All dissolved zinc results <66.5 mg/L were qualified as nondetect (U RB-I).
Inorganics (mg/L)							
Total Alkalinity and Bicarbonate Alkalinity	RB01T-GRW	2.7	2.77	1.0	3 of 3	1.0-499	All total alkalinity and bicarbonate alkalinity results <13.85 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW	2.8					
	RB03T-GRW	2.8					
Fluoride	RB02T-GRW	0.17	0.090	0.1	1 of 3	0.23-61.1	All fluoride results <0.045 mg/L were qualified as nondetect (U RB-I).

Analyte	Sample ID	Conc.	Avg. Conc.	RL	Frequency of Detection	Range for Field Samples	Action[1]
Chloride	RB01T-GRW	0.36	0.250	0.2	2 of 3	2.7-87.6	All chloride results <1.25 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW	0.29					
TDS	RB01T-GRW	11	26	5	3 of 3	26-208	All TDS results < 130 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW	11					
	RB03T-GRW	56					
TSS	RB01T-GRW	0.5	0.333	0.5	1 of 3	0.5-156	All TSS results < 1.67 mg/L were qualified as nondetect (U RB-I).
TKN	RB03T-GRW	2.6	0.947	0.2	1 of 3	0.24-3.2	None of the TKN results were greater than 5x the average rinsate blank concentration.
Ammonia as N	RB03T-GRW	0.062	0.034	0.04	1 of 3	0.04-0.61	All ammonia as N results < 0.17 mg/L were qualified as nondetect (U RB-I).

ND= Nondetect MDL=Method Detection Limit RL= Reporting Limit

[1] Criteria for qualification was based on 5x the average concentration found in the rinsate blanks.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

5.2.2 Surface Water Rinsate Blanks

Table 5-7 summarizes the analytes detected in the associated RI/FS surface water rinsate blank samples. Similarly as with the groundwater rinsate blanks, this table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 5-7
Summary of Surface Water Rinsate Blank Results and Additional Qualifications

Analyte	Sample ID	Conc.	Ave. Conc.	RL	Frequency of Detection	Range for Field Samples	Action[1]
Metals (ug/l)							
Iron	RB01T-SFW	96.5	96.5	27.8	1 of 1	64.2-239	None of the iron results were greater than 5x the average rinsate blank concentration.
Zinc	RB01T-SFW	4.4	4.4	2.3	1 of 1	2.8-136	Total zinc results < 22.0 ug/L qualified as nondetect (U RB-I)
Inorganics (mg/L)							
Bicarbonate Alkalinity and Total Alkalinity	RB01T-SFW	2.8	2.8	1.0	1 of 1	58.2-134	All total alkalinity and bicarbonate alkalinity results <14.0 mg/L were qualified as nondetect (U RB-I).
TDS	RB01T-SFW	34	34	5	1 of 1	34-264	All TDS results < 170 mg/L were qualified as nondetect (U RB-I).

ND= Nondetect MDL=Method Detection Limit RL= Reporting Limit

[1] Criteria for qualification was based on 5x the average concentration found in the rinsate blanks.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

5.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field Blanks are generated by pouring laboratory-supplied reagent grade water into certified pre-cleaned sample containers, at the sample collection site. In accordance with the project QAPP, field blanks were only required for organic parameters, therefore, no field blanks were required for the November 2003 Sampling Event.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory or rinsate blank contamination. In addition, some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summaries. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment for November 2003

Analysis Type	QC Measure	# of Analytes Measured	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	FD	36	35	97
	LD	36	36	100
Total metals	FD	63	63	100
	LD	63	63	100
Dissolved Metals	FD	63	63	100
	LD	63	63	100
SURFACE WATER				
Inorganics	FD	12	11	100
	LD	12	11	100
Total Metal	FD	21	22	100
	LD	21	22	100
Dissolved Metals	FD	21	19	90
	LD	21	21	100

6.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Percent of MS (and MSD) recoveries meeting criteria are summarized in Table 6-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters.

Table 6-2
Summary of Accuracy Assessment for November 2003

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	MS	34	31	94
Total Metals	MS	58	51	88
Dissolved Metals	MS	57	51	89
SURFACE WATER				
Inorganics	MS	13	11	85
Total Metals	MS	22	22	100
Dissolved Metals	MS	21	21	100

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results were considered usable as qualified for meeting project objectives, with the exception of total and dissolved chromium results which were rejected for one groundwater sample on the basis of extremely low matrix spike recoveries. As such, a percentage of 99.9% was calculated to represent the completeness of groundwater samples and 100% for surface water samples, both of which satisfied the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the groundwater and surface water samples collected during the May 2003 sampling event. The close agreement between the field duplicate results, as discussed in Section 5.1, indicated that the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 5.2 indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following

standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. As such, obtaining some nondetect results with elevated reporting limits was not avoidable. While it is anticipated that all data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT225C Sampling Event: November 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Ansley Watson Date Completed: 1/21/04

Peer Reviewer: Stacey Coker Date Completed: 1/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2, 3]	Laboratory Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganic
MW-20-T01N-GRW	SA	550042/117588-1		W	X	X
MW-20-D01N-GRW	SA	550043		W	X	
MW-21-T01N-GRW	SA	550044/117588-2		W	X	X
MW-21-D01N-GRW	SA	550045		W	X	
MW-22-T01N-GRW	SA	550046/117588-3		W	X	X
MW-22-D01N-GRW	SA	550047		W	X	
MW-23-T01N-GRW	SA	550048/117588-4		W	X	X
MW-23-D01N-GRW	SA	550049		W	X	
MW-25-T01N-GRW	SA	550050/117588-5		W	X	X
MW-25-D01N-GRW	SA	550051		W	X	
MW-26-T01N-GRW	SA	550052/117588-6		W	X	X
MW-26-D01N-GRW	SA	550053		W	X	
MW-1-T01N-GRW	SA	550054/117588-7		W	X	X
MW-1-D01N-GRW	SA	550055		W	X	
MW-17-T01N-GRW	SA	550056/117588-8		W	X	X
MW-17-D01N-GRW	SA	550057		W	X	
MW-24-T01N-GRW	SA	550058/117588-9		W	X	X
MW-24-D01N-GRW	SA	550059		W	X	
MW-28-T01N-GRW	SA	550060/117588-10		W	X	X
MW-28-D01N-GRW	SA	550061		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD=Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

[3] Due to the TKN being subcontracted to STL Seattle, an additional laboratory ID was assigned to each sample.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

As noted in the case narrative, the ammonia and total organic carbon (TOC) laboratory duplicate analyses associated with sample MW-1-T01N-GRW yielded relative percent differences that exceeded control criteria. However, upon further review the laboratory duplicate results satisfied the evaluation criteria in SOP 12.1.

The TKN analyses by method 351.3 were subcontracted to Severn Trent Laboratories (STL) Seattle, Washington facility. The SDG provided by STL-Seattle was included in its entirety at the end of the STL-Burlington submittal.

Post Data Review Inquiry, Investigation, and Resolution

During data interpretation, a senior hydrologist determined that the November 2, 2003 data for sample locations MW-20 and MW-21 were inadvertently reversed. His suspicion was built on the fact that the laboratory specific conductivity readings did not match the field conductivity readings. Additionally, the November 2003 results for MW-20 and MW-21 for many other inorganic and metal parameters did not fit the trends noted over numerous sampling events.

To investigate this issue, a review of field sampling paperwork was initiated. According to the associated logbooks, field data sheets, and field COC forms, the samples from locations MW-20 and MW-21 collected 0930 and 0955, respectively on November 2, 2003. Review of the COC form submitted to the laboratory indicated that the sample collection times were inadvertently reversed for these two samples. The table below summarizes this information.

Well ID	Sample Date	Sample Time [1]	Field pH (SU)	Field SC (uS/cm)	Lab pH (SU)	Lab SC (uS/cm)	Sample Time on COC Sent to Lab
MW-20	11-02-03	0955	7.34	416	7.6	1140	0930
MW-21	11-02-03	0930	7.34	1078	7.5	447	0955

[1] Sample collection time per logbook, field data sheet, and field COC form.

The problem is not noted in the data review table below because the laboratory failed to identify the discrepancy between the sample collection times on the sample bottles and COC form for these two samples. In the absences of finding any paperwork errors, the laboratory procedure is to logs samples into the LIMS in accordance with the information recorded on the laboratory COC. As such, the results reported for the sample collected at 0930 were as sample MW-20-T01N/D01N-GRW *rather than* MW-21-T01N/D01N-GRW, which is the correct set of sample IDs. Similarly, the results reported for the sample collected at 0955 were reported as sample MW-21-T01N/D01N-GRW *rather than* MW-20-T01N/D01N-GRW, which is the correct set of sample IDs.

To remedy this situation, the November 2, 2003 sample results for these two locations were associated with the proper site ID in the database.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 9 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony, beryllium, boron, chromium, copper, molybdenum, potassium and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS MW-1-T01N-GRW MW-1-D01N-GRW • LD MW-1-T01N-GRW MW-1-D01N-GRW	No	The matrix spike and laboratory duplicate analyses were conducted on samples MW-1-T01N-GRW and MW-1-D01N-GRW. All of the results satisfied the evaluation criteria in SOP 12.1. Therefore, no qualification was considered necessary. The matrix quality control results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MW-1-T01N-GRW MW-1-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the matrix spike samples for MW-1-T01N-GRW and MW-1-D01N-GRW, pH class C. Serial dilution results for sample MW-1-T01N-GRW and MW-1-D01N-GRW were applicable for 13 out of 24 metals each. For both samples, the percent difference between the original result and result for the diluted sample for antimony, arsenic, lead, potassium, thallium, and vanadium did not satisfy the ≤10% criterion and the results for this sample were qualified as estimated. Table 1.3 summarizes these results. The serial dilution results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package did not include any site-specific field quality control samples. The matrix quality control results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	The high standard of nitrate dropped on some ICALs, however all samples were within the range of the calibration curve.
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	Information regarding the mass resolution is not available due to software limitations. However, acceptable mass resolution can be inferred from the other QC sample results, which satisfied evaluation criteria.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (mhos/cm)	pH
MW-20-T01N-GRW	9.1 J	0.005 UJ	0.028 J	1140 J	7.6 J
MW-21-T01N-GRW	2.1 J	0.005 UJ	0.024 J	447 J	7.5 J
MW-22-T01N-GRW	0.46 J	0.005 UJ	0.011 J	237 J	8.1 J
MW-23-T01N-GRW	1.1 J	0.005 UJ	0.01 UJ	474 J	8.0 J
MW-25-T01N-GRW	0.32 J	0.005 UJ	0.019 J	288 J	8.1 J
MW-26-T01N-GRW	1.8 J	0.005 UJ	0.16 J	735 J	7.2 J
MW-1-T01N-GRW	0.90 J	0.005 UJ	0.019 J	990 J	7.3 J
MW-17-T01N-GRW	0.33 J	0.005 UJ	0.011 J	695 J	7.6 J
MW-24-T01N-GRW	1.4 J	0.005 UJ	0.016 J	360 J	7.5 J
MW-28-T01N-GRW	0.34 J	0.005 UJ	0.01 UJ	1400 J	7.3 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS) DF=2 (DF=2 for MB also)	1.0	0.9	1.0	0.9	1.068	0.5	MW-20-T01N-GRW, MW-17-T01N-GRW	U CCB, MB-L
Beryllium (P) DF=1					-0.622	0.3	All the samples in this SDG.	UJ MB-L or UJ CCB, MB-L
	0.6	2.2					MW-25-T01N-GRW, MW-25-D01N-GRW, MW-26-T01N-GRW, MW-26-D01N-GRW	
	0.5	0.3	0.9	1.2			MW-1-T01N-GRW, MW-17-D01N-GRW, MW-24-T01N-GRW, MW-24-D01N-GRW, MW-28-T01N-GRW, MW-28-D01N-GRW	
Boron (P) DF=1	6.7					6.4	MW-26-T01N-GRW	U CCB-I
Chromium (P) DF=1					1.634	1.3	All samples in this SDG with positive results.	U MB-I
Copper (P) DF=1			-2.1			2.0	MW-17-T01N-GRW, MW-17-D01N-GRW, MW-24-T01N-GRW, MW-24-D01N-GRW, MW-28-T01N-GRW, MW-28-D01N-GRW	UJ CCB-L
		4.3					MW-26-T01N-GRW	U CCB-I
Molybdenum (P) DF=1		-1.4	-2.6	-1.2		1.2	MW-24-T01N-GRW, MW-24-D01N-GRW	J CCB-L
Potassium (P) DF=1	1170	627.5			1560	521.7	MW-20-T01N-GRW, MW-20-D01N-GRW, MW-21-T01N-GRW, MW-21-D01N-GRW, MW-22-T01N-GRW, MW-22-D01N-GRW, MW-23-T01N-GRW, MW-23-D01N-GRW	U CCB, MB-I
							MW-25-T01N-GRW, MW-25-D01N-GRW, MW-26-T01N-GRW, MW-26-D01N-GRW	U MB-I
	-709.7		-1542	-1469			MW-1-T01N-GRW, MW-1-D01N-GRW, MW-17-T01N-GRW, MW-17-D01N-GRW, MW-24-T01N-GRW, MW-24-D01N-GRW, MW-28-T01N-GRW, MW-28-D01N-GRW	UJ CCB, MB-L or UJ CCB-L
Zinc (P) DF=10	2.2	2.4			12.01	1.9	MW-20-D01N-GRW, MW-23-T01N-GRW, MW-23-D01N-GRW, MW-25-T01N-GRW, MW-26-D01N-GRW, MW-17-T01N-GRW, MW-24-T01N-GRW	U CCB, MB-I or U MB-I

P=ICP MB=Method Blank CCBx=Continuing Calibration Blank IDL=Instrument Detection Limit RL=

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
MW-1-T01N-GRW			
Antimony	16.6%	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample UJ DL-L
Arsenic	12.0%		Qualify parent sample J DL-L
Lead	11.8%		Qualify parent sample J DL-L
Silver	12.1%		Qualify parent sample UJ DL-L
Thallium	14.7%		Qualify parent sample UJ DL-L
Vanadium	13.6%		Qualify parent sample J DL-L
MW-1-D01N-GRW			
Antimony	17.7%	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample UJ DL-L
Arsenic	12.5%		Qualify parent sample UJ DL-L
Lead	17.5%		Qualify parent sample UJ DL-L
Silver	13.5%		Qualify parent sample UJ DL-L
Thallium	18.6%		Qualify parent sample UJ DL-L
Vanadium	14.9%		Qualify parent sample J DL-L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT226C Sampling Event: November 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 1/7/04

Peer Reviewer: Stacey Coker Date Completed: 1/24/04

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
MW-27-T01N-GRW	SA	550087		W	X	X
MW-27-D01N-GRW	SA	550088		W	X	
MW-29-T01N-GRW	SA	550089		W	X	X
MW-29-D01N-GRW	SA	550090		W	X	
MW-29-T01D-GRW	FD	550091		W	X	X
MW-29-D01D-GRW	FD	550092		W	X	
MW-9A-T01N-GRW	SA	550093		W	X	X
MW-9A-D01N-GRW	SA	550094		W	X	
RB03T-GRW	RB	550095		W	X	
RB03D-GRW	RB	550096		W	X	X
RB01T-SOL	RB	550097		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD=Field Duplicate

1 The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

2 Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

As noted in the case narrative, during the inorganic data review process the cation/anion balances for the samples in this sample delivery group (SDG) were evaluated to check the correctness of the analyses. All of the samples exhibited ion balance percent differences and ratios of calculated versus measured total dissolved solids (TDS) that were within the validation limits except sample RB03T-GRW. This sample,

and sample RB01T-SOL were re-analyzed for TDS beyond the prescribed holding time. Table 1.1 summarizes the holding time qualifications. The TDS results from the second analyses of these samples were generally lower, and the ratios of calculated TDS concentrations to measured TDS concentrations were within guidelines. Data from the second TDS analyses have been reported in this SDG, and are further discussed in the cation/anion balance section below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 15 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, beryllium, cobalt, copper, iron, molybdenum, and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MW-27-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample MW-27-T01N-GRW, pH class C, applicable for 0 out of 24 analytes. The serial dilution results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Li was high for samples RB03T-GRW, RB03D-GRW, and RB01T-SOL. However, the potassium results were all reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample RB03T/D-GRW, the cation/anion balances was outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary.
Field QC • Field Duplicate (FD) MW-29-T01D-GRW MW-29-D01D-GRW • Rinsate Blank (RB) RB03T-GRW RB03D-GRW RB01T-SOL • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	The field duplicate results satisfied the applicable concentration-dependent evaluation criteria and data qualification was not necessary. There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.3. The field quality control results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Conductivity (mhos/cm)	pH
MW-27-T01N-GRW	0.75 J	0.005 UJ	0.019 J	---	391 J	7.6 J
MW-29-T01N-GRW	0.25 J	0.005 UJ	0.020 J	---	1690 J	7.3 J
MW-29-T01D-GRW	0.26 J	0.005 UJ	0.019 J	---	1660 J	7.3 J
MW-9A-T01N-GRW	0.54 J	0.005 UJ	---	---	1370 J	7.3 J
RB03T-GRW	0.20 UJ	0.005 UJ	---	56 J	12.7 J	7.4 J
RB01T-SOL	0.20 UJ	0.005 UJ	0.014 J	42 J	85 J	6.4 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=10		42.1	78.5	103.9				30.7	MW-27-T01N-GRW, MW-29-T01N-GRW, MW-29-D01N-GRW, MW-29-T01D-GRW, MW-29-D01D-GRW, MW-9A-D01N-GRW RB03D-GRW RB01T-SOL	U CCB-I
Antimony (MS) DF=2				0.9	1.1	1.0		0.5	MW-27-T01N-GRW	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=1	0.7		-0.5				1.03	0.3	All samples in this SDG.	UJ CCB, MB-L or UJ CCB-L
Cobalt (P) DF=10							-3.678	3.2	All samples in this SDG.	UJ/J MB-L
Copper (P) DF=1	-2.2						-3.116	2.0	MW-27-T01N-GRW, MW-27-D01N-GRW, MW-29-T01N-GRW, MW-29-D01N-GRW, MW-29-T01D-GRW, MW-29-D01D-GRW	UJ/J CCB-L
									All samples in this SDG.	UJ/J MB-L
Iron (P) DF=10							-31.93	30.0	All samples in this SDG.	UJ/J MB-L
Molybdenum (P) DF=1			1.2					1.2	MW-9A-T01N-GRW, MW-9A-D01N-GRW	U CCB-I
Sodium (P) DF=10				1213				501.9	MW-29-T01D-GRW, MW-29-D01D-GRW, MW-9A-T01N-GRW, MW-9A-D01N-GRW, RB03T-GRW	U CCB-I

P=ICP MB=Method Blank CCBx=Continuing Calibration Blank IDL=Instrument Detection Limit RL=

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Rinsate Blank Detections

Analytes	RB03T-GRW	RB03D-GRW	RB01T-SOL
TDS (mg/L)	56.0	---	42.0
TSS (mg/l)	---	---	6.5
Ammonia as N (mg/l)	0.062	---	0.048
Bicarbonate Alkalinity (mg/l)	2.8	---	2.6
Total Alkalinity (mg/l)	2.8	---	2.6
Phosphorus (mg/l)	---	---	0.07
Lead (µg/l)	0.42	---	0.65
Vanadium (µg/l)	---	---	0.22
Zinc (µg/l)	24.7	20.9	40.9

--- = Sample was not analyzed for these parameters; therefore no qualification was necessary.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT227A Sampling Event: November 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 1/19/04

Peer Reviewer: Stacey Coker Date Completed: 1/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
MMW-47A-T01N-GRW	SA	550132		W	X	X
MMW-47A-D01N-GRW	SA	550133		W	X	
MMW-45A-T01N-GRW	SA	550134		W	X	X
MMW-45A-D01N-GRW	SA	550135		W	X	
MMW-45A-T01D-GRW	FD	550136		W	X	X
MMW-45A-D01D-GRW	FD	550137		W	X	
MMW-29A-T01N-GRW	SA	550326		W	X	X
MMW-29A-D01N-GRW	SA	550327		W	X	
SPRING 13-T01N-GRW	SA	550328		W	X	X
SPRING 13-D01N-GRW	SA	550329		W	X	
LOWER SPRING 13-T01N-GRW	SA	550330	LOWERSPRNG13-T01N-GRW	W	X	X
LOWER SPRING 13-D01N-GRW	SA	550331	LOWERSPRNG13-D01N-GRW	W	X	
MMW-49A-T01N-GRW	SA	550332		W	X	X
MMW-49A-D01N-GRW	SA	550333		W	X	
MMW-45B-T01N-GRW	SA	550334		W	X	X
MMW-45B-D01N-GRW	SA	550335		W	X	
MMW-33A-T01N-GRW	SA	550336		W	X	X
MMW-33A-D01N-GRW	SA	550337		W	X	
MMW-48A-T01N-GRW	SA	550477		W	X	X
MMW-48A-D01N-GRW	SA	550478		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD=Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Field IDs LOWER SPRING 13-T01N/D01N-GRW were truncated to LOWERSPRNG13-T01N/D01N-GRW to accommodate the field length in the LIMS.
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 7-9 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Chromium, mercury, and nickel were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS MMW-29A-T01N-GRW MMW-29A-D01N-GRW • LD MMW-29A-T01N-GRW MMW-29A-D01N-GRW	No	Matrix spike analyses were conducted on samples MMW-29A-T01N-GRW and MMW-29A-D01N-GRW. Nine matrix spike results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued. The matrix quality control results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-29A-T01N-GRW MMW-29A-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the matrix spike samples for MMW-29A-T01N-GRW and MMW-29A-D01N-GRW (pH class A). Serial dilution results for samples MMW-29A-T01N-GRW and MMW-29A-D01N-GRW were applicable for 2 out of 24 metals each. For these two analytes, the serial dilution results satisfied the evaluation criteria. The serial dilution results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-45B-T01N-GRW, MMW-45B-D01N-GRW, and MW-45A-D01D-GRW. Therefore, molybdenum and beryllium results for all samples were reported from the trace ICP. The trace ICP molybdenum and beryllium reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample MMW-33A-T01N/D01N-SFW the analysis of dissolved zinc, 5520µg/L, exceeded that of the total analysis, 3830 µg/L, beyond variation expected due to the accuracy limitations of the method. Therefore, the results were qualified as estimated UJ/J TvP-I. The orthophosphate and phosphorus results were qualified as estimated (J/UJ TvP-I) because the orthophosphate result was greater than the phosphorus result.
Field QC • Field Duplicate (FD) MW-45A-T01D-GRW MW-45A-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package included one set of field duplicate samples. The field duplicate results satisfied the evaluation criteria in SOP 12.1. The field quality control results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	Upon further investigation by the reviewer, it was observed that the laboratory incorrectly logged in samples MMW-47A-T01N/D01N-GRW, MMW-45A-T01N/D01N-GRW, and MMW-45A-T01D/D01D-GRW by removing the first M from each sample. The form 1s sample reports have been hand corrected, and no further action was considered necessary.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (mhos/cm)	pH
MW-47A-T01N-GRW	1.5 J	0.005 UJ	0.01 UJ	1120 J	4.9 J
MW-45A-T01N-GRW	0.45 J	0.005 UJ	---	1570 J	3.9 J
MW-45A-T01D-GRW	0.33 J	0.005 UJ	---	1550 J	5.0 J
MMW-29A-T01N-GRW	3.0 J	0.005 UJ	0.016 J	1440 J	3.5 J
SPRING 13-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	2090 J	4.9 J
LOWER SPRING 13-T01N-GRW	0.20 UJ	0.005 UJ	0.077 J	1770 J	3.9 J
MMW-49A-T01N-GRW	3.0 J	0.005 UJ	0.032 J	1660 J	3.8 J
MMW-45B-T01N-GRW	0.20 UJ	0.005 UJ	0.049 J	2560 J	3.9 J
MMW-33A-T01N-GRW	2.8 J	0.005 UJ	0.016 J	1710 J	4.3 J
MMW-48A-T01N-GRW	0.20 UJ	0.005 UJ	0.11 J	3560 J	5.8 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Chromium (P) DF=100	-5.3	-5.0	-5.9	-6.0	-4.859		All samples in this SDG.	UJ CCB, MB-L
Mercury (CV) DF=1			-0.1				MMW-29A-D01N-GRW, SPRING 13-T01N-GRW, SPRING 13-D01N-GRW, LOWER SPRING 13-T01N-GRW, LOWER SPRING 13-D01N-GRW	UJ CCB-L
Nickel (P) DF=100			-3.1	-2.5	-4.279		All samples in this SDG.	UJ/J MB-L or UJ/J CCB, MB-L

CV=Cold Vapor P=ICP MB=Method Blank CCBx=Continuing Calibration Blank IDL=Instrument Detection Limit

RL=Reporting Limit DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
MMW-29A-T01N-GRW					
Total Alkalinity	42.2	NA		NONE	J MS-L parent sample only
Ammonia an N	72.1	NA	75-125%	NONE	J MS-L parent sample only
Cadmium	128.0	101.6		Parent sample result is nondetect and suggested bias is high.	No qualification
Chromium	0	99.2		Parent sample result is nondetect	R MS-L parent sample only
Cyanide	31.0	100.6		NONE	UJ MS-L parent sample only
MMW-29A-D01N-GRW					
Arsenic	74.3	105.9	75-125%	NONE	UJ MS-L parent sample only
Chromium	0	100.6		Parent sample result is nondetect	R MS-L parent sample only
Copper	133.1	103.5		NONE	J MS-H parent sample only
Zinc	155.9	103.8		NONE	J MS-H parent sample only

NA = Not appropriate

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT228S Sampling Event: November 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 1/14/04

Peer Reviewer: Stacey Coker Date Completed: 1/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses		
					Metals	Inorganic	BOD/COD
RR-DS-SPRING 13-T01N-SFW	SA	550220	RRDSSPRING13-T01N-SFW or RRDSSPRING13-T01N-SF	W	X	X	X
RR-DS-SPRING 13-D01N-SFW	SA	550221	RRDSSPRING13-D01N-SFW or RRDSSPRING13-D01N-SF	W	X		
RR-DS-SPRING 13-T01D-SFW	FD	550222	RRDSSPRING13-T01D-SFW or RRDSSPRING13-T01D-SF	W	X	X	X
RR-DS-SPRING 13-D01D-SFW	FD	550223	RRDSSPRING13-D01D-SFW or RRDSSPRING13-D01D-SF	W	X		
RR-US-SPRING 13-T01N-SFW	SA	550224	RRUSSPRING13-T01N-SFW or RRUSSPRING13-T01N-SF	W	X	X	X
RR-US-SPRING 13-D01N-SFW	SA	550225	RRUSSPRING13-D01N-SFW or RRUSSPRING13-D01N-SF	W	X		
RR-DS-SPRING 39-T01N-SFW	SA	550226	RRDSSPRING39-T01N-SFW or RRDSSPRING39-T01N-SF	W	X	X	X
RR-DS-SPRING 39-D01N-SFW	SA	550227	RRDSSPRING39-D01N-SFW or RRDSSPRING39-D01N-SF	W	X		
RR-US-SPRING 39-T01N-SFW	SA	550228	RRUSSPRING39-T01N-SFW or RRUSSPRING39-T01N-SF	W	X	X	X
RR-US-SPRING 39-D01N-SFW	SA	550229	RRUSSPRING39-D01N-SFW or RRUSSPRING39-D01N-SF	W	X		
RB01T-SFW	RB	550230		W	X	X	X
RB01D-SFW	RB	550231		W	X		
LR-6-T01N-SFW	SA	550800		W	X	X	X
LR-6-D01N-SFW	SA	550801		W	X		
LR-4-T01N-SFW	SA	550802		W	X	X	X
LR-4-D01N-SFW	SA	550803		W	X		

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD=Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

As noted in the case narrative, during the inorganic data review process the cation/anion balances for the samples in this sample delivery group (SDG) were evaluated to check the correctness of the analyses. All of the samples exhibited ion balance percent differences and ratios of calculated versus measured total dissolved solids (TDS) that were within the validation limits except RB01T-SFW. This sample was re-analyzed for TDS beyond the prescribed holding time. Table 1.1 summarizes the holding time qualifications. The TDS results from the second analyses of these samples were generally lower, and the ratios of calculated TDS to measured TDS were within guidelines. Data from the second TDS analyses have been reported in this SDG, and are further discussed in the cation/anion balance section below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	For all the RR-DS-SPRING 13 or SPRING 39 and RR-US-SPRING 13 or SPRING 39 samples, the first two hyphens were removed from the field ID in order to accommodate the field length in the LIMS. Also, the quality control sample IDs RR-US-SPRING13-T01N/D01N-SFW were truncated to RRUSSPG13-T01N/D01N-SFW.
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 13-15 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, chromium, molybdenum, potassium, and pH were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RR-US-SPRING 13-T01N-SFW RR-US-SPRING 13-D01N-SFW • LD RR-US-SPRING 13-T01N-SFW RR-US-SPRING 13-D01N-SFW	NA	Matrix spike analyses were conducted on samples RR-US-SPRING 13-T01N-SFW and RR-US-SPRING 13-D01N-SFW. Two matrix spike results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued. Laboratory duplicates (LD) analyses were conducted on samples RR-US-SPRING 13-T01N-SFW and RR-US-SPRING 13-D01N-SFW. All of the LD results were within acceptance limits; no qualification was considered necessary. The matrix quality control results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-US-SPRING 13-T01N-SFW RR-US-SPRING 13-D01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the matrix spike samples for RR-US-SPRING 13-T01N-SFW and RR-US-SPRING 13-D01N-SFW, pH class C. Serial dilution results for sample RR-US-SPRING 13-T01N-SFW and RR-US-SPRING 13-D01N-SFW were applicable for 20 out of 24 metals each. For sample RR-US-SPRING 13-T01N-SFW, the percent difference between the original result and result for the diluted sample for selenium did not satisfy the ≤10% criterion and the result for this sample was qualified as estimated. For sample RR-US SPRING 13-D01N-SFW, the percent difference between the original result and result for the diluted sample for cadmium did not satisfy the ≤10% criterion and the result for this sample was qualified as estimated. Table 1.4 summarizes these results. The serial dilution results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. For sample RR-DS-SPRING 13-T01N-SFW the analysis of orthophosphate exceeded that of the total phosphorus analysis beyond variation expected due to the accuracy limitations of the method. Table 1.5 summarizes these results and the data qualification. For sample RB01T/D-SFW, the cation/anion balances was outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary.
Field QC • Field Duplicate (FD) RR-DS-SPRING 13-T01D-SFW RR-DS-SPRING 13-D01D-SFW • Rinsate Blank (RB) RB01T-SFW/RB01D-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were a few field duplicate results that did not satisfy the applicable concentration-dependent evaluation criteria. These are summarized in Table 1.6. There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.7. The field quality control results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Conductivity (mhos/cm)	pH
RRDS SPRING 13-T01N-SFW	0.38 J	0.005 UJ	0.049 J	---	563 J	7.0 J
RRDS SPRING 13-T01D-SFW	0.38 J	0.005 UJ	0.01 UJ	---	379 J	7.1 J
RRUS SPRING 13-T01N-SFW	0.36 J	0.005 UJ	0.01 UJ	---	362 J	7.5 J
RRDS SPRING 39-T01N-SFW	0.34 J	0.005 UJ	0.01 UJ	---	349 J	7.4 J
RRUS SPRING 39-T01N-SFW	---	0.005 UJ	0.01 UJ	---	313 J	7.4 J
RB01T-SFW	---	0.005 UJ	0.01 UJ	34 J	6.1 J	7.3 J
LR-6-T01N-SFW	0.20 UJ	0.005 UJ	0.03 J	---	696 J	7.2 J
LR-4-T01N-SFW	0.20 UJ	0.005 UJ	0.01 UJ	---	461 J	7.8 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=1				24.2		22.1	LR-4-D01N-SFW	U CCB-I
Antimony (MS) DF=1	1.0	1.0	0.8	0.8		0.5	RR-DS-SPRING 13-T01N-SFW, RR-US-SPRING 13-D01N-SFW, RR-DS-SPRING 39-T01N-SFW,	U CCB-I
Chromium (P) DF=1		-1.2				1.1	All samples in this SDG with the exception of the below: LR-6-T01N-SFW, LR-6-D01N-SFW, LR-4-T01N-SFW, LR-4-D01N-SFW	UJ CCB-L
Molybdenum (P) DF=1	0.9	0.2		0.2	0.514	0.2	All samples in this SDG with the exception of the below: RB01T-SFW LR-6-T01N-SFW, LR-6-D01N-SFW, LR-4-T01N-SFW, LR-4-D01N-SFW	U CCB, MB-I
Potassium (P) DF=1	-346.8	-333.9	-347.9			318.0	All samples in this SDG with the exception of the below: LR-6-T01N-SFW, LR-6-D01N-SFW, LR-4-T01N-SFW, LR-4-D01N-SFW	UJ/J CCB-L

P=ICP MB=Method Blank CCBx=Continuing Calibration Blank IDL=Instrument Detection Limit RL=

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS% R	PDS %R	Criteria	Comment	Action
RRUS SPRING 13-T01N-SFW					
Sulfate	15.0	NA	75-125%	NONE	J MS-L parent
Ammonia an N	71.2	NA		NONE	UJ MS-L parent

NA = Not appropriate

Table 1.4
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
RR-US-SPRING 13-T01N-SFW			
Selenium	15.6	Control limit should be when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample J DL-L
RR-US-SPRING 13-D01N-SFW			
Cadmium	11.8	Control limit should be when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample J DL-L

Table 1.5
Total vs. Dissolved Qualifications

Sample/Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
RR-DS-SPRING 13-T01N-SFW				
Orthophosphate vs. phosphorus	0.039	0.01	Absolute difference >2x RL (i.e., 0.02)	UJ/J TvP-I for samples RR-DS-SPRING 13-T01N-SFW

Note: The instrument detection limit (IDL), adjusted for dilution, is used as the reporting limit (RL) for total vs. partial evaluations.

Table 1.6
Field Duplicates Not Meeting Criteria

Sample/ Analytes	RPD	RL (µg/l)	Evaluation Criteria	Action
RR-DS-SPRING 13-D01N/D01D-SFW				
Aluminum	RPD=41.2%	22.1	Both samples are > than 5x RL, precision is indicated by an RPD ≤30%.	These results were qualified as estimated in the parent samples (J FD-I).
	Absolute difference	**RL (µg/l)**	**Evaluation Criteria**	
Iron	AD=257.3 (µg/l)	27.8	Absolute difference >2x RL (i.e., 55.6)	
RR-DS-SPRING 13-T01N/T01D-SFW				
	RPD	**RL (mg/l)**	**Evaluation Criteria**	
Bicarbonate	RPD=55.5%	1.0	Both samples are > than 5x RL, precision is indicated by an RPD ≤30%.	These results were qualified as estimated in the parent samples (J FD-I).
Total Alkalinity	RPD=55.5%	1.0		
TSS	RPD=55.6%	0.77		

AD=Absolute difference

Table 1.7
Rinsate Blank Detections

Analytes	RB01T-SFW
Bicarbonate Alkalinity (mg/l)	2.8
Total Alkalinity (mg/l)	2.8
Iron (µg/l)	96.5
Zinc (µg/l)	4.4

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT229C Sampling Event: November 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 1/7/04

Peer Reviewer: Stacey Coker Date Completed: 1/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
RB01T-TLG	RB	550248		W	X	X
RB02T-SOL	RB	550249		W	X	
RB03T-SOL	RB	550250		W	X	X
RB04T-SOL	RB	550251		W	X	
MMW-28A-T01N-GRW	SA	550252		W	X	X
MMW-28A-D01N-GRW	SA	550253		W	X	
MMW-44B-T01N-GRW	SA	550254		W	X	X
MMW-44B-D01N-GRW	SA	550255		W	X	
RB01T-GRW	RB	550256		W	X	X
RB01D-GRW	RB	550257		W	X	
MMW-31B-T01N-GRW	SA	550258		W	X	X
MMW-31B-D01N-GRW	SA	550259		W	X	
RB02T-GRW	RB	550260		W	X	X
RB02D-GRW	RB	550261		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD=Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues potentially affecting data quality but not addressed by the review table below, were noted in the case narrative.

During the TKN analysis on 11/18/03, the continuing calibration verification (CCV1) standard exhibited a percent recovery (87.5%) that was slightly below control criteria (90-110%). The analytical results from this analytical sequence are formally reported. All of the associated samples were bracketed by the affected CCV; therefore all of the TKN results are qualified as estimated (UJ/J CCV-L).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 15 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, beryllium, chromium, copper, molybdenum, potassium, selenium, sodium, zinc, and pH were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-28A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample MMW-28A-T01N-GRW, pH class C, applicable for 0 out of 24 analytes. The serial dilution results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-31B-T01N-GRW and MMW-31B-D01N-GRW. Therefore, molybdenum results for all samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For samples RB01T/D-GRW and RB02T/D-GRW, the cation/anion balances were outside the acceptance range of ±13% and it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit for samples RB01T/D-GRW and RB02T/D-GRW. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB01T-TLG RB02T-SOL RB03T-SOL RB04T-SOL RB01T-GRW RB01D-GRW RB02T-GRW RB02D-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.3. The field quality control results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for the respective sample matrix (i.e., ground water samples vs. surface water samples).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (mhos/cm)	pH
RB01T-TLG	---	0.005 UJ	0.01 UJ	0.42 J	6.6 J
RB02T-SOL	---	0.005 UJ	0.01 UJ	0.21 J	5.2 J
RB03T-SOL	---	0.005 UJ	0.01 UJ	0.01 J	5.1 J
RB04T-SOL	---	0.005 UJ	0.01 UJ	0.08 J	5.3 J
MMW-28A-T01N-GRW	0.51 J	0.005 UJ	0.01 UJ	804 J	6.1 J
MMW-44B-T01N-GRW	---	0.005 UJ	0.01 UJ	2750 J	6.7 J
RB01T-GRW	---	0.005 UJ	0.01 UJ	17.1 J	6.8 J
MMW-31B-T01N-GRW	---	0.005 UJ	0.01 UJ	2850 J	6.6 J
RB02T-GRW	---	0.005 UJ	0.01 UJ	68.7 J	7.2 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=10			31.4	57.1	73.1		30.7	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, RB01T-GRW, RB01D-GRW, RB02T-GRW	U CCB-I
Beryllium (P) DF=1			-0.6				0.3	RB01T-GRW, RB01D-GRW, RB02T-GRW, RB02D-GRW	UJ/J CCB-L
Chromium (P) DF=1			2.2				1.3	RB01T-GRW, RB02T-GRW	U CCB-I
Copper (P) DF=1	2.1		3.5			2.392	2.0	RB01T-TLG, RB03T-SOL, MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, RB01T-GRW, RB01D-GRW, MMW-31B-T01N-GRW, RB02T-GRW	U CCB, MB-I
Molybdenum (P) DF=1		-1.2					1.2	RB01T-TLG, RB02T-SOL RB03T-SOL, RB04T-SOL, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, RB01T-GRW, RB01D-GRW, MMW-31B-T01N-GRW, MMW-31B-D01N-GRW RB02T-GRW, RB02D-GRW	UJ/J CCB-L
Potassium (P) DF=1		-1101 4404					521.7	All samples in SDG.	UJ/J CCB-L
Selenium (MS) DF=2			0.3				0.3	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, MMW-31B-T01N-GRW, MMW-31B-D01N-GRW	U CCB-I
Sodium (P) DF=10				577			501.9	MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-31B-D01N-GRW	U CCB-I
Zinc (P) DF=10						3.408 170.4	2.0	RB02T-SOL, RB04T-SOL, MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, MMW-44B-T01N-GRW, MMW-44B-D01N-GRW, RB01T-GRW, RB01D-GRW, RB02T-GRW, RB02D-GRW,	U MB-I

P=ICP MB=Method Blank CCBx=Continuing Calibration Blank IDL=Instrument Detection Limit RL=
DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Rinsate Blank Detections

Analytes	RB01T-TLG	RB02T-SOL	RB03T-SOL	RB04T-SOL	RB01T-GRW	RB02T-GRW
TDS (mg/l)	144	126	96	124	---	---
TSS (mg/l)	---	0.9	---	0.6	0.5	---
Chloride (mg/l)	---	---	---	0.29	0.36	0.29
Ammonia as N (mg/l)	---	---	---	0.042	---	
Bicarbonate Alkalinity (mg/l)	2.4	2.6	2.4	4.3	2.7	2.8
Total Alkalinity (mg/l)	2.4	2.6	2.4	4.3	2.7	2.8
Fluoride (mg/l)	---	---	---	---	---	0.17
Cadmium (µg/l)	0.92	---	---	---	---	---
Chromium (µg/l)	2.1	---	1.5	---	---	---
Manganese (µg/l)	---	---	49.1	---	---	---
Selenium (µg/l)	0.72	---	---	---	---	---
Thallium (µg/l)	0.21	---	---	---	---	---

---=Sample was not analyzed for these parameters; therefore no qualification was necessary.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT230A Sampling Event: November 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 1/14/04

Peer Reviewer: Stacey Coker Date Completed: 1/20/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
SPRING 39 PUMP-T01N-GRW	SA	550288	SPRING39PUMP-T01N-GRW	W	X	X
SPRING 39 PUMP-D01N-GRW	SA	550289	SPRING39PUMP-D01N-GRW	W	X	
MMW-10A-T01N-GRW	SA	550290		W	X	X
MMW-10A-D01N-GRW	SA	550291		W	X	
GWW-1-T01N-GRW	SA	550292		W	X	X
GWW-1-D01N-GRW	SA	550293		W	X	
GWW-2-T01N-GRW	SA	550294		W	X	X
GWW-2-D01N-GRW	SA	550295		W	X	
SPRING 13 PUMP-T01N-GRW	SA	550296	SPRING13PUMP-T01N-GRW	W	X	X
SPRING 13 PUMP-D01N-GRW	SA	550297	SPRING13PUMP-D01N-GRW	W	X	
GWW-3-T01N-GRW	SA	550298		W	X	X
GWW-3-D01N-GRW	SA	500299		W	X	
GWW-3-T01D-GRW	FD	550300		W	X	X
GWW-3-D01D-GRW	FD	550301		W	X	
MMW-17A-T01N-GRW	SA	550302		W	X	X
MMW-17A-D01N-GRW	SA	550303		W	X	
MMW-17B-T01N-GRW	SA	550304		W	X	X
MMW-17B-D01N-GRW	SA	550305		W	X	
MMW-44A-T01N-GRW	SA	550306		W	X	X
MMW-44A-D01N-GRW	SA	550307		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD=Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

During the inorganic data review process the cation/anion balances for the samples in this sample delivery group (SDG) were evaluated to check the correctness of the analyses. All of the samples exhibited ion balance percent differences and ratios of calculated versus measured total dissolved solids (TDS) that were within the validation limits except samples collected from locations GWW-1, GWW-2, SPRING13PUMP, MMW-17A, and MMW-17B. For these samples, the percent difference between the total cations and total anions exceeded the ≤13% evaluation criteria. The results for detected analytes compared well with historical results. Therefore, elevated cation reporting limits (potassium and sodium) associated with the dilutions for "A" class samples are suspected to be the cause for elevated percent differences. As such, data qualification was not considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	For the SPRING 39 PUMP and SPRING 13 PUMP samples, the spaces were removed from the field ID to accommodate the field length allowable by the LIMS. Also, the quality control sample IDs SPRING 39 PUMP-T01N/D01N-GRW was truncated to SPG39PUMP-T01N/D01N-GRW.
Holding Times	No	The original total dissolved solids (TDS) analysis of sample MMW-44A-T01N-GRW, which was performed within holding time, yielded a net weight after drying that greatly exceeded the upper limit of the method. This sample was re-analyzed outside of holding the time using a smaller volume, yielding results comparable to the original analysis. The results from the re-analysis have been formally presented in this case submittal, with the data from the original analysis being presented in the raw data section of the data package. The original sulfate analyses for samples MMW-17A-T01N-GRW and MMW-17B-T01N-GRW were accomplished within the prescribed hold time. However, these samples were over-diluted and required more concentrated analyses, which were performed eight days beyond the holding time. For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 15 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony, beryllium, copper, mercury, molybdenum, zinc, and pH were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS SPRING 39 PUMP-T01N-GRW SPRING 39 PUMP-D01N-GRW • LD SPRING 39 PUMP-T01N-GRW SPRING 39 PUMP-D01N-GRW	No	Matrix spike analyses were conducted on samples SPRING 39 PUMP-T01N-GRW and SPRING 39 PUMP-D01N-GRW. Eight matrix spike results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued. Laboratory duplicates analyses were conducted on samples SPRING 39 PUMP-T01N-GRW and SPRING 39 PUMP-D01N-GRW. One laboratory duplicate result was outside acceptance limits. Tables 1.4 summarize this result and the data qualification issued. The matrix quality control results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution SPRING 39 PUMP-T01N-GRWS SPRING 39 PUMP-D01N-GRWS • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the matrix spike samples for SPRING 39 PUMP-T01N-GRW and SPRING 39 PUMP-D01N-GRW, pH class A. Serial dilution results for sample SPRING 39 PUMP-T01N-GRW was applicable for 1 out of 24 metals each. For sample SPRING 39 PUMP-D01N-GRW, the percent difference between the original result and result for the diluted sample for molybdenum did not satisfy the ≤10% criterion and the results for this sample were qualified as estimated. Table 1.4 summarizes these results. The serial dilution results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. Recovery for internal standard Y was high for the ICPMS analysis of samples SPRING 39PUMP-T01N-GRW, SPRING 39 PUMP-D01N-GRW, MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, MMW-44A-T01N-GRW, and MMW-44A-D01N-GRW. Therefore, molybdenum and beryllium results for all samples were reported from the trace ICP. The trace ICP molybdenum and beryllium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The anion/cation balance percent difference exceeded the acceptance range of ±13% in samples GWW-1-T01N/D01N-GRW (13.39%), GWW-2-T01N/D01N-GRW (22.66%), SPRING 13 PUMP-T01N/D01N-GRW (15.42%), MMW-17A-T01N/D01N-GRW (22.00%), and MMW-17B-T01N/D01N-GRW (25.79%). Upon further review and calculation, sample GWW-1-T01N/D01N-GRW (recalculation =6.01%) does not appear to be out of the acceptance range of ≤13%, therefore no further qualifications are considered necessary. Four of the cation concentrations contributing to the calculation of this balance (Ca^{2+}, K^{+}, Na^{+}, and Al^{3+}) were not detected above the instrument detection limit (IDL) and were therefore reported at the detection limit for the other four samples. Recalculation of the ion balance for samples GWW-2-T01N/D01N-GRW, SPRING 13 PUMP-T01N/D01N-GRW, MMW-17A-T01N/D01N-GRW, and MMW-17B-T01N/D01N-GRW, using a value of one for all of the samples reported at the detection limit, resulted in a cation/anion balance of 8.83%, 7.17%, 13.26%, and 11.75%, respectively. The concentrations were low enough that reporting limits for nondetect major cations controlled the calculations. The balances were therefore not an appropriate measure of accuracy. No qualification was considered necessary. The orthophosphate and phosphorus results for sample SPRING39PUMP-T01N-GRW were qualified as estimated (J/UJ TVP-I) because the orthophosphate result was greater than the phosphorus results.
Field QC • Field Duplicate (FD) GWW-3-T01D-GRW GWW-3-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	All field duplicate results satisfied the evaluation criteria specified in SOP 12.1 and data qualification was not necessary. The field quality control results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Sulfate (mg/L)	Conductivity (mhos/cm)	pH
SPRING 39 PUMP-T01N-GRW	1.9 J	0.005 UJ	0.032 J	---	---	1780 J	5.0 J
MMW-10A-T01N-GRW	5.0 J	0.005 UJ	0.031 J	---	---	2170 J	4.6 J
GWW-1-T01N-GRW	3.3 J	0.005 UJ	0.021 J	---	---	1460 J	4.8 J
GWW-2-T01N-GRW	3.1 J	0.005 UJ	0.022 J	---	---	1910 J	4.5 J
SPRING 13 PUMP-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	---	---	1770 J	3.7 J
GWW-3-T01N-GRW	3.2 J	0.005 UJ	0.026 J	---	---	1770 J	4.3 J
GWW-3-T01D-GRW	3.1 J	0.005 UJ	0.029 J	---	---	1740 J	4.3 J
MMW-17A-T01N-GRW	0.25 J	0.005 UJ	0.01 UJ	---	397 J	766 J	4.4 J
MMW-17B-T01N-GRW	0.24 J	0.005 UJ	0.01 J	---	412 J	758 J	4.6 J
MMW-44A-T01N-GRW	0.2 UJ	0.005 UJ	0.052 J	4040 J	---	3320 J	4.6 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (P) DF=10			-9.1			8.2	All sample in this SDG with the following exceptions: SPRING 39 PUMP-T01N-GRW, SPRING 39 PUMP-D01N-GRW	UJ CCB-L
Beryllium (P) DF=10	0.7	1.3	1.2	0.3	0.821	0.3	All samples in this SDG except MMW-44A-T01N-GRW.	U CCB, MB-I or U CCB-I
Copper (P) DF=100				5.4	3.657	2.0	All sample in this SDG with the following exceptions: MMW-17A-T01N-GRW, MMW-44A-T01N-GRW, MMW-44A-D01N-GRW	U CCB, MB-I or U MB-I
Mercury (CV) DF=1				-0.1		0.1	SPRING 39 PUMP-D01N-GRW, MMW-10A-T01N-GRW, MMW-10A-D01N-GRW, GWW-1-T01N-GRW, GWW-1-D01N-GRW	UJ CCB-L
Molybdenum (P) DF=10	2.4	1.5		2.6	2.738	1.2	SPRING 39 PUMP-T01N-GRW, GWW-1-D01N-GRW, GWW-2-T01N-GRW, GWW-3-T01N-GRW, GWW-3-T01D-GRW, MMW-17B-T01N-GRW	U CCB.MB-I
Zinc (P) DF=100					2.664	2.0	MMW-17A-T01N-GRW, MMW-17A-D01N-GRW, MMW-17B-T01N-GRW, MMW-17B-D01N-GRW	U MB-I

P=ICP MB=Method Blank CCBx=Continuing Calibration Blank IDL=Instrument Detection Limit RL=

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
SPRING 39 PUMP-T01N-GRW					
Total Alkalinity	15.0	NA		NONE	J MS-L parent
Total Organic Carbon	71.2	NA		NONE	UJ MS-L parent
Arsenic	66.5	98.5		NONE	UJ MS-L parent
Cadmium	138.6	109.4	75-125%	Parent sample result is nondetect.	No qualification
Manganese	71.2	103.5		NONE	UJ MS-L parent
Nickel	135.2	109.8		Parent sample result is nondetect.	No qualification
SPRING 39 PUMP-D01N-GRW					
Cadmium	138.0	111.8		Parent sample result is nondetect	No qualification
Nickel	142.0	111.2		Parent sample result is nondetect	No qualification

NA = Not appropriate

Table 1.4
Laboratory Duplicates Not Meeting Criteria

Sample/Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
SPRING 39 PUMP-T01N-GRW				
Phosphorus	0.013	0.01	Absolute difference <1x RL (i.e., ≤0.01)	J D-I parent

Table 1.5
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
SPRING 39 PUMP-D01N-GRW			
Molybdenum	12.3%	Control limit of % D ≤ 10% should be met when the concentration in the original sample is a factor of 50 above the IDL.	Qualify parent sample UJ DL-L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT231C Sampling Event: November 2003 GRW/SFW

Matrix: Soil ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 1/12/04

Peer Reviewer: Stacey Coker Date Completed: 1/23/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
MMW-42B-T01N-GRW	SA	550457		W	X	X
MMW-42B-D01N-GRW	SA	550458		W	X	
CC2B-T01N-GRW	SA	550459		W	X	X
CC2B-D01N-GRW	SA	550460		W	X	
CC1A-T01N-GRW	SA	550461		W	X	X[3]
CC1A-D01N-GRW	SA	550462		W	X	
CC1B-T01N-GRW	SA	550463		W	X	X
CC1B-D01N-GRW	SA	550464		W	X	
CC2A-T01N-GRW	SA	550465		W	X	X
CC2A-D01N-GRW	SA	550466		W	X	
MMW-2-T01N-GRW	SA	550467		W	X	X
MMW-2-D01N-GRW	SA	550468		W	X	
MMW-3-T01N-GRW	SA	550469		W	X	X
MMW-3-D01N-GRW	SA	550470		W	X	
RB01T-SED	RB	550740		W	X	X
DP-1-T01N-GRW	SA	550741		W	X	X
DP-1-D01N-GRW	SA	550742		W	X	
DP-2-T01N-GRW	SA	550743		W	X	X
DP-2-D01N-GRW	SA	550744		W	X	
DP-3-T01N-GRW	SA	550745		W	X	X
DP-3-D01N-GRW	SA	550746		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD=Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

[3] Limited inorganics due to limited sample volume available.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

During the metal analyses of the samples in this sample delivery group (SDG), the linear range verification standard yielded percent recoveries for barium, cadmium, and nickel that were slightly below control criteria. The concentrations of these elements in the associated field samples were well below this standard and were in the lower end of the calibration range.

The ICP/MS analysis of sample DP-3-T01N-GRW yielded a concentration of lead that exceeded the range of calibration instrument response. However, the ICP trace analysis yielded percent recoveries of lead in the ICSAB standard that exceeded control criteria. The lead results were comparable between the two instruments. Therefore, the results from the trace ICP analysis have been formally presented. Data qualification based on the high Pb recovery for the ICSAB standard (129%) was not necessary because none of the instrument concentrations of the interferent elements (i.e., Ca, Mg, Al, and Fe) exceeded those of the ICSA or ICSAB solutions.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	An aliquot for total suspended solids (TSS) was sent for sample RB01T-SED; however the laboratory accidentally did not log the sample for analysis of this analyte. Inorganic list for solids was different and the inorganics analyzed for solid RBs was supposed to be shorter and not even.
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 15 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, beryllium, chromium, molybdenum, potassium, zinc, and pH were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the November 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution MMW-42B-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on sample MMW-42B-T01N-GRW, pH class C, applicable for 2 out of 24 analytes. The result for this one metal was within acceptance limits and data qualification was not necessary. The serial dilution results for the November 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Li was high for the ICPMS analysis of sample RB01T-SED. Therefore, potassium results for all samples were reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Y was high for the ICPMS analysis of samples CC2A-T01N-GRW, MMW-2-T01N-GRW, MMW-2-D01N-GRW, and DP-3-T01N-GRW. Therefore, molybdenum results for all samples were reported from the trace ICP. The trace ICP molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Tb was high for the ICPMS analysis of sample MMW-2-T01N-GRW. Therefore, barium and cadmium results for all samples were reported from the trace ICP. The trace ICP barium and cadmium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB01T-SED • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	For sample RB01T-SED, the ammonia as N was detected at 0.047 mg/L. The field quality control results for the November 2003 GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (mhos/cm)	pH
MMW-42B-T01N-GRW	0.20 UJ	0.005 UJ	0.027 J	2880 J	6.9 J
CC2B-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1820 J	7.0 J
CC1A-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	637 J	7.2 J
CC1B-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	642 J	7.2 J
CC2A-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1460 J	6.2 J
MMW-2-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	2530 J	6.1 J
MMW-3-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	2380 J	6.7 J
RB01T-SED	0.20 UJ	NA	NA	16.5 J	5.5 J
DP-1-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1200 J	6.9 J
DP-2-T01N-GRW	0.20 UJ	0.005 UJ	0.023 J	1080 J	7.0 J
DP-3-T01N-GRW	0.22 J	0.005 UJ	0.01 UJ	1530 J	7.0 J

NA=Not applicable for this sample

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P) DF=10	24.2						21.7	MMW-42B-T01N-GRW	U CCB-I
Beryllium (P) DF=1		0.5				0.518	0.3	MMW-42B-T01N-GRW, CC2B-T01N-GRW, CC2B-D01N-GRW, CC1A-T01N-GRW, CC1B-T01N-GRW, MMW-3-T01N-GRW, MMW-3-D01N-GRW, RB01T-SED, DP-2-D01N-GRW, DP-3-D01N-GRW	U CCB, MB-I or U MB-I
Chromium (P) DF=1						6.372	1.3	MMW-42B-T01N-GRW, CC1A-T01N-GRW	U MB-I
Molybdenum (P) DF=1		1.7					1.2	CC1B-T01N-GRW	U CCB-I
Potassium (P) DF=1		827.4	602.6	615.7	706.7		521.7	CC1B-T01N-GRW, CC1B-D01N-GRW, DP-1-D01N-GRW, DP-2-T01N-GRW, DP-2-D01N-GRW	U CCB-I
Zinc (P) DF=10						2.639	1.9	CC1A-T01N-GRW, CC1B-D01N-GRW, RB01T-SED	U MB-I

P=ICP MB=Method Blank CCBx=Continuing Calibration Blank IDL=Instrument Detection Limit RL=

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE DECEMBER 2003 SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

May 2004

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Dilution Schemes/Non-Detects With Elevated RLs 3-1
3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 3-1
3.2.3 Non-Valid Matrix Spikes 3-2
3.2.4 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Summary/Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-2
4.1.1 Metals and Inorganic Matrix Spike Results 4-2
4.1.2 Organic Matrix Spike Results 4-5
4.2 Laboratory Duplicates (Precision Evaluation) 4-5
4.2.1 Metal and Inorganic Groundwater and Surface Water Laboratory Duplicate 4-6
4.2.2 Organic Spikes Duplicate Results 4-6
4.3 Serial Dilution Results 4-6
4.3.1 Groundwater Serial Dilutions 4-6
4.3.2 Surface Water Serial Dilutions 4-8

Section 5 Collective Summary/Assessment of Field QC Results 5-1

5.1 Field Duplicate Samples 5-1
5.1.1 Groundwater Field Duplicate Results 5-2
5.1.2 Surface Water Field Duplicates Results 5-2
5.2 Rinsate Blank Results 5-2
5.2.1 Groundwater Rinsate Blanks 5-3
5.2.2 Surface Water Rinsate Blanks 5-4
5.3 Field Blank Results 5-5

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-2
6.3 Completeness 6-2
6.4 Representativeness 6-2
6.5 Comparability 6-3
6.6 Sensitivity 6-3

TABLE OF CONTENTS

List of Tables

Table 1-1	Summary of Groundwater Samples Collected December 2003
Table 1-2	Summary of Surface Water Samples Collected December 2003
Table 4-1	Field Samples Submitted for Matrix Spike
Table 4-2	Count of Matrix Spike Samples Collected in December, 2003 Sampling Event
Table 4-3	Metals and Inorganics Matrix Spike Results for Groundwater Samples
Table 4-4	Inorganic Matrix Spike Results for Surface Water Samples
Table 4-5	Matrix Spike/Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Organic Groundwater Samples
Table 4-6	ICP Serial Dilution Exceedances for Groundwater Samples
Table 4-7	ICP Serial Dilution Exceedances for Surface Water Samples
Table 5-1	Summary of Field Duplicate Water Samples Collected Summer 2003
Table 5-2	Field Duplicate Collection Frequency for the December, 2003 Sampling Event
Table 5-3	Rinsate Blank Collected During the December 2003 Sampling Event
Table 5-4	Rinsate Blank Collection Frequency for the December, 2003 Sampling Event
Table 5-5	Summary of Groundwater Rinsate Blank Results and Additional Qualifications
Table 5-6	Summary of Surface Water Rinsate Blank Results and Additional Qualifications
Table 5-7	Field Blanks Collected During the December, 2003 Sampling Event
Table 5-8	Field Blank Collection Frequency for the December, 2003 Sampling Event
Table 6-1	Summary of Precision Assessment for December 2003
Table 6-2	Summary of Accuracy Assessment for December 2003

List of Attachments

Attachment 1.1	Data Package WAT232C
Attachment 1.2	Data Package WAT233C
Attachment 1.3	Data Package WAT234A
Attachment 1.4	Data Package WAT235A
Attachment 1.5	Data Package WAT236A
Attachment 1.6	Data Package WAT237C
Attachment 1.7	Data Package WAT238S

This Data Validation Report (DVR) provides a general overview of the usability of chemical data obtained from the December 2003 sampling activities at Molycorp. In addition, this data validation report is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

This report contains the results of the data validation conducted for groundwater and surface water samples collected in December of 2003 at the Molycorp Questa Mine, Questa, New Mexico. These water samples were collected in support of the Remedial Investigation/ Feasibility Study (RI/FS). The water samples were sent to Severn Trent Laboratories (STL) Burlington in Colchester, VT. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods used and quality control samples collected were in accordance with the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). The results were reported in seven original data packages.

The groundwater and surface water samples collected during the December 2003 sampling event and their associated chemical analyses are summarized in Tables 1-1 and 1-2, respectively. Included in these tables is the frequency of QC samples collected for each matrix.

Table 1-1
Summary of Groundwater Samples Collected December 2003

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganics	VOC by SW846 Method 8260B	PAHs by SW846 Method 8270-SIM	TPH-DRO by SW846 Method 8015
MW-1-T01N-GRW (WAT232C)	X, MS, LD	X, MS, LD	X, MS, LD			
MW-9A-T01N-GRW (WAT232C)	X	X	X			
MW-22-T01N-GRW (WAT232C)	X	X	X			
MW-23-T01N-GRW (WAT232C)	X	X	X			
MW-20-T01N-GRW (WAT232C)	X	X	X			
MW-17-T01N-GRW (WAT232C)	X	X	X			
MW-24-T01N-GRW (WAT232C)	X	X	X			
MW-25-T01N-GRW (WAT232C)	X	X	X			
MW-26-T01N-GRW (WAT232C)	X	X	X			
MW-21-T01N-GRW (WAT233C)	X	X	X			
MMW-31B-T01N-GRW (WAT233C)	X	X	X			
MMW-44B-T01N-GRW (WAT233C)	X	X	X			
MMW-42B-T01N-GRW (WAT233C)	X	X	X			
MW-28-T01N-GRW (WAT233C)	X, FD	X, FD	X, FD			
MW-29-T01N-GRW (WAT233C)	X	X	X			
MW-27-T01N-GRW (WAT233C)	X, RB	X, RB	X, RB			
MMW-17B-T01N-GRW (WAT234A)	X	X	X			
MMW-17A-T01N-GRW (WAT234A)	X	X	X			
MMW-45B-T01N-GRW (WAT234A)	X, RB	X, RB	X, RB			
MMW-44A-T01N-GRW (WAT234A)	X	X	X			
MMW-47A-T01N-GRW (WAT234A)	X, FD	X, FD	X, FD			
MMW-45A-T01N-GRW (WAT234A)	X, FD	X, FD	X, FD			
MMW-48A-T01N-GRW (WAT235A)	X	X	X	X, MS, MSD, FD FB, RB, TB[2]	X, MS, MSD, FD, FB, RB, TB[2]	X, MS, MSD, FD, FB, RB, TB[2]
MMW-33A-T01N-GRW (WAT236A)	X, MS, LD	X, MS, LD	X, MS, LD			

Table 1-1
Summary of Groundwater Samples Collected December 2003

Sample Identification (SDG)[1]	Total Metals	Dissolved Metals	Inorganics	VOC by SW846 Method 8260B	PAHs by SW846 Method 8270-SIM	TPH-DRO by SW846 Method 8015
SPRING 13 PUMP-T01N-GRW (WAT236A)	X, MS, LD	X, MS, LD	X, MS, LD			
GWW-1-T01N-GRW (WAT236A)	X	X	X			
GWW-2-T01N-GRW (WAT236A)	X	X	X			
GWW-3-T01N-GRW (WAT236A)	X	X	X			
SPRING 39 PUMP-T01N-GRW (WAT236A)	X	X	X			
MMW-29A-T01N-GRW (WAT236A)	X	X	X			
MMW-10A-T01N-GRW (WAT236A)	X	X	X			
MMW-49A-T01N-GRW (WAT236A)	X, RB	X, RB	X, RB			
SPRING 13-T01N-GRW (WAT236A)	X	X	X			
SUMP5000-T01N-GRW (WAT237C)	X	X	X			
LOWER SPRING 13-T01N-GRW (WAT237C)	X	X	X			
COLUMBINE CANYON-T01N-GRW (WAT237C)	X	X	X			
MMW-28A-T01N-GRW (WAT237C)	X	X	X			
CC1A-T01N-GRW (WAT237C)	X	X	X			
CC1B-T01N-GRW (WAT237C)	X	X	X			
CC2A-T01N-GRW (WAT237C)	X	X	X			
CC2B-T01N-GRW (WAT237C)	X	X	X			
Number GW samples	41	41	41	1	1	1
Number MS/MSD or MS/LD	3	3	3	1	1	1
Number Field Duplicates	3	3	3	1	1	1
Number Rinsate Blanks	3	3	3	1	1	1
Number Field Blanks	NA	NA	NA	1	1	1

NA = Not Applicable MS = Matrix Spike LD = Laboratory Duplicate MSD = Matrix Spike Duplicate
RB = Rinsate Blank FB = Field Blank FD = Field Duplicate TB = Trip Blank
DRO = Diesel Range Organics PAH = Polyaromatic Hydrocarbons TPH = Total Petroleum Hydrocarbons
VOC = Volatile Organic Compounds SIM =Selective Ion Monitoring Mode
[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.
[2]These organic analyses were collected for a non-RI/FS purpose. As such, these methods are not included in the QAPP.

Table 1-2
Summary of Surface Water Samples Collected December 2003

Sample Identification	Total Metals	Dissolved Metals	Inorganics
RR-US-SPRING 13-T01N-SFW (WAT238S)	X, MS, LD	X, MS, LD	X, MS, LD
RR-DS-SPRING 39-T01N-SFW (WAT238S)	X	X	X
RR-DS-SPRING 13-T01N-SFW (WAT238S)	X, FD	X, FD	X, FD
RR-US-SPRING 39-T01N-SFW (WAT238S)	X, RB	X, RB	X, RB
Number SFW samples	4	4	4
Number MS/MSD or MS/LD	1	1	1
Number Field Duplicates	1	1	1
Number Rinsate Blanks	1	1	1

MS = Matrix Spike LD = Laboratory Duplicate FD = Field Duplicate RB = Rinsate Blank
[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

The QAPP required that the quality control samples listed above be collected at a frequency of 5%. As illustrated by the tables above, the required frequency of QC analyses was satisfied for each analysis type.

The review consisted of an evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, Inductively Coupled Plasma (ICP) Spectroscopy serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, and rinsate blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Section 3.0 includes the data review narratives for each of the data packages. In all cases of professional judgment exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data validation narrative.

After completing the review of sample-specific and laboratory performance parameters in accordance with SOP 12.1, the site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. The reason for this is that site-specific QC samples are considered much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Where applicable, the potential direction of bias (high, low, or indeterminate) has been identified and noted on the sample results sheets as H, L, or I, respectively.

Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification.

An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 6.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for the data packages included in this event. In order to attain the frequency requirements for laboratory performance reviews, one data package (WAT235A) was evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identify whether findings globally affect all relevant water samples analyzed for the December 2003 Groundwater and Surface Water Sampling Event. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

3.2.1 Dilution Schemes/Non-Detects with Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilbria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

3.2.3 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. They are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration.
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked analytes. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.4 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL data package WAT235A was used to evaluate laboratory performance criteria. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameter evaluation was found to be acceptable and no additional packages for this event required assessment of laboratory performance parameters.

Inorganic parameter matrix QC consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. Organic parameter QC consisted of matrix spike/matrix spike duplicate (MS/MSD) analyses. The site-specific matrix QC results were assessed collectively for the December 2003 Groundwater and Surface Water Sampling Event by matrix (groundwater and surface water) to determine the need for qualification of sample results of similar matrix.

Three groundwater field samples were designated for both total/dissolved metals, and inorganics matrix spike analyses. One groundwater field sample was designated for volatile, semivolatile, and total petroleum hydrocarbon organics matrix spike analyses. One surface water field sample was designated for total/dissolved metals, and inorganics matrix spike analyses, as summarized in Table 4-1. Table 4-2 summarizes the breakdown of frequency requirements for each of the analyses per each matrix for the December 2003 Groundwater and Surface Water Sampling Event.

Table 4-1
Field Samples Submitted for Matrix Spike

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	VOCs[2]	PAHs[2]	TPH-DRO[2]
MW-1-T01N-GRW	Groundwater	WAT232C	x	x	x			
MMW-48A-T01N-GRW	Groundwater	WAT235A				x	x	x
MMW-33A-T01N-GRW	Groundwater	WAT236A	x	x	x			
SPRING 13 PUMP-T01N-GRW	Groundwater	WAT236A	x	x	x			
RR-US-SPRING 13-T01N-SFW	Surface water	WAT238S	x	x	x			

[1]For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".

[2]These organic analyses were collected for a non-RI/FS purpose. As such, these methods are not included in the QAPP.

Table 4-2
Count of Matrix Spike Samples Collected in December, 2003 Sampling Event

Analyses	Number of MS or MS/MSD samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	3	41	7.3
Dissolved Metals	3	41	7.3
Inorganics	3	41	7.3
VOCs	1	1	100
PAHs	1	1	100
TPH	1	1	100
Surface Water			
Total Metals	1	4	25
Dissolved Metals	1	4	25
Inorganics	1	4	25

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results. A number of spikes recoveries were outside of the QC acceptance limits of 75-125% for both inorganics and metals. In general, if less than a quarter of the valid spike recoveries (i.e., the sample concentration was no greater than four times the spike added) for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix may have been qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

4.1.1 Metals and Inorganic Matrix Spike Results

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results.

Tables 4-3 and 4-4 summarize the groundwater and surface water, respectively, inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

4.1.1.1 Groundwater Matrix Spike

Although the majority of the groundwater matrix spike recoveries were within acceptance limits, a few exceedances were observed resulting in data qualification. Results were generally qualified as estimated but a nondetect sample result for sample MMW-33A-T01N-GRW was rejected based on a low matrix spike recovery that was less than 30%.

Table 4-3
Metals and Inorganic Matrix Spike Results for Groundwater Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Total Metals					
Aluminum	1	0	0	92.0	
Antimony	3	0	0	112.1	
Arsenic	3	0	0	133.8	
Barium	3	0	0	102.1	
Beryllium	3	0	0	113.4	
Boron	3	0	0	107.1	
Cadmium	1	0	0	110.2	
Chromium	1	0	0	112.3	
Cobalt	3	0	0	114.6	
Copper	3	0	0	119.0	

Table 4-3
Metals and Inorganic Matrix Spike Results for Groundwater Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Iron	1	0	0	116.8	
Lead	3	0	0	110.5	
Manganese	1	0	0	100.6	
Mercury	3	0	0	95.4	
Molybdenum	3	0	0	109.1	
Selenium	3	0	0	98.0	
Nickel	3	0	**1**	136.6	J MS-H, all positive results
Thallium	3	0	0	110.6	
Silver	3	0	0	107.0	
Vanadium	3	0	0	106.0	
Zinc	2	0	0	115.1	
Dissolved Metals					
Aluminum	1	0	0	92.2	
Antimony	3	0	0	110.8	
Arsenic	2	0	0	113.1	
Barium	3	0	0	103.0	
Beryllium	3	0	0	104.5	
Boron	3	0	0	104.0	
Cadmium	1	0	0	105.4	
Chromium	1	0	0	106.6	
Cobalt	3	0	0	113.3	
Copper	3	0	0	97.6	
Iron	1	0	0	116.8	
Lead	3	0	0	110.1	
Manganese	1	0	0	103.4	
Mercury	3	0	0	97.6	
Molybdenum	3	0	0	102.9	
Selenium	3	0	0	106.4	
Nickel	3	0	0	87.7	
Thallium	3	0	0	113.5	
Silver	3	0	0	106.8	
Vanadium	3	0	0	105.5	
Zinc	2	0	0	105.9	
Inorganics[1]					
Chloride	3	0	0	100.5	
Nitrate	3	0	0	108.1	
Total ALK	1	0	0	98.0	
Fluoride	3	0	0	100.2	
Ammonia	3	0	0	92.5	
TKN	3	**1**	0	81.7	J/UJ MS-L, parent sample only
Nitrite	3	0	**1**	132.3	J MS-H positive parent sample result only
Ortho-P	3	0	0	104.2	
Phosphate	3	0	0	92.9	
Sulfate	3	0	0	102.9	
TOC	3	0	0	90.8	

Table 4-3
Metals and Inorganic Matrix Spike Results for Groundwater Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Cyanide	3	**1**	0	66.6	UJ/J MS-L, all results, with the exception of sample MMW-33A-T01N-GRW which was rejected R MS-L, for a nondetect parent result.

[1] MS recoveries for the bicarbonate and total alkalinity analyses are not an appropriate measure of accuracy due to the highly variable pH range (see Section 3.2.2). Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not used to assess the accuracy of the analysis.

For nickel and nitrite, it was considered necessary to extend qualification to the balance of the December 2003 groundwater samples because more than a quarter of the spike results were outside evaluation criteria and the average recovery was also outside the acceptance range. The cyanide sample result for MMW-33A-T01N-GRW was rejected on the basis of a low matrix spike recovery and all other cyanide results were qualified as estimated (J MS-L) because the average recovery was outside the acceptance range. Since there were only four matrix spike recoveries outside of limits of a total of 162 matrix spike results, the vast majority (>97%) were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

4.1.1.2 Surface Water Matrix Spike

Although the majority of the surface water matrix spike recoveries were within acceptance limits, one exceedance was observed in the inorganic analysis of TKN. All matrix spike recoveries met criteria for total and dissolved metals.

Table 4-4
Inorganics Matrix Spike Results for Surface Water Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Inorganics					
TKN	1	**1**	0	71.0	UJ/J MS-L all sample results

For the analyte listed in the table above, it was considered necessary to extend qualification to the balance of the December 2003 surface water samples due to the small data set and the magnitude of the exceedance. Since there was only one matrix spike recovery outside of limits of a total of 56 matrix spike results, the vast majority (>98%) were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

4.1.1.3 Post Digestion Spikes

4.1.1.3 Post-Digestion Spikes

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the matrix spike exceedances were the result of sample matrix, and/or due to a bias in the analytical system. Recoveries for nearly all post-digestion spikes were within the acceptance

limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

4.1.2 Organic Matrix Spike Results

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy and precision of the analytical results. Only sample MMW-48A-T01N-GRW was analyzed for organic parameters. The organic sample aliquots were collected for a non-RI/FS purpose and were not covered by the RI/FS QAPP. As such, the historical lab limits were used for evaluation.

All of the matrix spike recoveries for the PAHs and TPH methods were within the acceptable recoveries; therefore no qualification was necessary. However, as shown in Table 4-5, some recoveries for VOC target analytes were outside the associated acceptance ranges.

Table 4-5
Matrix Spike/ Matrix Spike Duplicate Outliers and Corresponding Results Qualification for Organic Groundwater Samples

Analyte	No. of Valid Spikes	Recoveries <LCL	Recoveries >UCL	Average %R	Action
VOC-MS and MSD					
2-Chloroethyl Vinyl Ether (60-140)	2	0	0	0	R MS-L for MMW-48A-T01N-GRW and its field duplicate
Styrene (80-124)	2	**2**	0	17.3	UJ/J MS-L for MMW-48A-T01N-GRW and its field duplicate
Bromoform (82-120)	2	**2**	0	54	UJ/J MS-L for MMW-48A-T01N-GRW and its field duplicate
Chloroprene (60-140)	2	**2**	0	31.3	UJ/J MS-L for MMW-48A-T01N-GRW and its field duplicate
m,p-xylene (78-116)	2	**1**	0	53.7	UJ/J MS-L for MMW-48A-T01N-GRW and its field duplicate
o-xylene (81-125)	2	**1**	0	54.7	UJ/J MS-L for MMW-48A-T01N-GRW and its field duplicate
1,3,5-Trimethylbenzene (72-112)	2	**1**	0	47.7	UJ/J MS-L for MMW-48A-T01N-GRW and its field duplicate

For a few of the VOC analytes listed in the table above, it was considered necessary to extend qualification to the balance of the December 2003 groundwater samples because more than a quarter of the spike results were outside evaluation criteria. The 2-chloroethyl vinyl ether sample results for MMW-48A-T01N-GRW was rejected on the basis of a low matrix spike recovery. Since there was five matrix spike recoveries and eight matrix spike duplicate recoveries out of limits of a total 166 matrix spike/matrix spike duplicate results, the vast majority, 94%, were within acceptance limits.

4.2 LABORATORY DUPLICATES (PRECISION EVALUATION)

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows, as required in the QAPP. The RPD criterion of ≤20% was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL. For metals, the Contract Laboratory Program (CLP) Contract Required Detection

Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

4.2.1 Metal and Inorganic Groundwater and Surface Water Laboratory Duplicate

All of the metal and inorganic groundwater and surface water laboratory duplicate results were within the laboratory acceptance limits.

4.2.2 Organic Spikes Duplicate Results

For VOCs, PAHs, and TPH, the duplicate spikes were conducted on field samples. All of the organic spiked duplicate results were within the laboratory acceptance limits.

4.3 SERIAL DILUTION RESULTS

ICP serial dilutions are analyzed to help evaluate whether or not interferences exist due to sample matrix. When analyte concentrations are sufficiently high (50x greater than the instrument detection limit [IDL]), the original and five-fold dilution results are expected to agree within 10%. Otherwise, interferences resulting in signal suppression or enhancement might be suspected.

The original and diluted sample results are compared by a percent difference (%D). When %Ds of ≤10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate than the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result.

In general, qualification was limited to the percent sample if fewer than a quarter of the applicable serial dilutions results were outside the acceptance range. Conversely, if more than a quarter of the applicable serial dilution results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average %D, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

4.3.1 Groundwater Serial Dilutions

Table 4-6 lists the number of applicable groundwater serial dilution results for analytes that exceeded criteria. With the exceptions noted in the table, all remaining %Ds between the original sample results and the result obtained from a five-fold diluted sample were ≤10%.

Table 4-6
ICP Serial Dilution Exceedances for Groundwater Samples

Analyte	Number of Serial Dilution Samples Analyzed	Number of Valid Results	%Ds >10%	Avg. %Ds	Potential Bias Direction		Action
					Low	High	
Total Arsenic	7	1	1	12.7	0	1	UJ/J DL-L, parent (MW-1) results only
Total Cadmium	7	1	1	13.3	1	0	UJ/J DL-L, parent (SUMP5000) results only
Total Cobalt	7	1	1	14.0	1	0	UJ/J DL-L, parent (SUMP5000) results only
Total Copper	7	1	1	11.2	1	0	UJ/J DL-L, parent (SUMP5000) results only
Total Molybdenum	7	3	1	12.5	0	1	UJ/J DL-H, parent (MMW-33A) results only
Total Nickel	7	1	1	15.9	1	0	UJ/J DL-L, parent (SUMP5000) results only
Total Thallium	7	1	1	10.5	0	1	UJ/J DL-H, parent (MW-1) results only
Total Vanadium	7	1	1	12.7	0	1	UJ/J DL-H, parent (MW-1) results only
Dissolved Antimony	3	1	1	20.3	0	1	UJ/J DL-H, parent (MW-1) results only
Dissolved Arsenic	3	1	1	16.5	0	1	UJ/J DL-L, parent (MW-1) results only
Dissolved Lead	3	1	1	22.3	0	1	UJ/J DL-H, parent (MW-1) results only
Dissolved Molybdenum	3	3	1	12.6	0	1	UJ/J DL-H, parent (SPRING 13 PUMP) results only
Dissolved Thallium	3	1	1	21.8	0	1	UJ/J DL-H, parent (MW-1) results only
Dissolved Silver	3	1	1	22.8	0	1	UJ/J DL-H, parent (MW-1) results only
Dissolved Vanadium	3	1	1	19.7	0	1	UJ/J DL-H, parent (MW-1) results only
Dissolved Zinc	3	1	1	13.8	1	0	UJ/J DL-L, parent (MW-1) results only

Since only sixteen out of a possible 240 serial dilutions were outside of limits, the vast majority (>93%) were within acceptance limits. The few samples that were qualified were limited to parent sample results for the following reasons:

- Although a third of the total molybdenum serial dilution results were out, qualification was limited to the parent sample because only one result was out and the exceedance was marginal (12.5%).
- Although third of the dissolved molybdenum results were out; only one sample result that was applicable and the exceedance was marginally (12.6%).
- Although the exceedance for the total nickel result was slightly more than marginal (greater than 15.0%), only one sample result of seven was applicable for evaluating the entire data set of forty-one groundwater samples.
- More than a quarter of the total arsenic, cadmium, cobalt, copper thallium, and vanadium applicable serial dilutions results were out; however, only one sample result of seven was applicable for evaluating the entire data set of forty-one groundwater samples and the exceedances were marginal (less than 15%).
- Qualification for dissolved antimony, arsenic, lead, thallium, silver, vanadium, and zinc was limited to the parent sample, MW-1-D01N-GRW. For this sample, seven of nine applicable serial dilution results were out with %Ds that are considered more than marginal exceedances. As there were so fewer problems with the serial dilution on its total (i.e., unfiltered) counterpart, it was considered likely that the potential interference problems were limited to the parent sample.

4.3.2 Surface Water Serial Dilutions

Table 4-7 lists the number of applicable surface water serial dilution results for analytes that exceeded criteria. With the exceptions noted in the table, all remaining %Ds between the original sample results and the result obtained from a five-fold diluted sample were ≤10%.

Table 4-7
ICP Serial Dilution Exceedances for Surface Water Samples

Analyte	Number of Serial Dilution Samples Analyzed	Number of Valid Results	%Ds >10%	Avg. %Ds	Potential Bias Direction		Action
					Low	High	
Total Arsenic	1	1	1	12.8	1	0	UJ/J DL-L, parent (RR-US-Spring 13-T01N-GRW) results only
Total Selenium	1	1	1	11.3	1	0	

[1]The table is limited to analytes for which the serial dilution results were

Since only two out of a possible 24 serial dilution results were outside of limits, the vast majority (>92%) were within acceptance limits. The two samples that were qualified were limited to parent sample results because there was only one valid detect for the respective total result and the average %D was less than 10%.

The site-specific blanks (field and rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. Field duplicate agreement was assessed to determine the overall precision of the analyses; both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. The following sections present a discussion on the filed duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

5.1 FIELD DUPLICATE SAMPLES

Five field duplicate sample pairs were collected during this sampling event. The field duplicate pairs and frequencies are listed in the Tables 5-1 and 5-2 below. As there were forty-one groundwater and four surface water samples collected, the frequency of field duplicate collection satisfied the QAPP requirement of 5%.

Table 5-1
Summary of Field Duplicate Water Samples Collected Summer 2003

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	VOCs[2]	PAHs[2]	TPH-DRO[2]
MW-28-T01N-GRW/ MW-28-T01D-GRW	Groundwater	WAT233C	x	x	x			
MMW-47A-T01N-GRW/ MMW-47A-T01D-GRW	Groundwater	WAT234A	x	x	x			
MMW-45A-T01N-GRW/MMW-45A-T01D-GRW	Groundwater	WAT234A	x	x	x			
MMW-48A-T01N-GRW/MMW-48A-T01D-GRW	Groundwater	WAT235A				x	x	x
RR-DS-SPRING-13-T01N-SFW/ RR-DS-SPRING-13-T01D-SFW	Surface water	WAT238S	x	x	x			

[1]For the dissolved metals samples, the "T01N" component of the field ID was replaced with "D01N".
[2]These organic analyses were collected for a non-RI/FS purpose. As such, these methods are not included in the QAPP.

Table 5-2
Field Duplicate Collection Frequency for the December, 2003 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	3	41	8
Dissolved Metals	3	41	8
Inorganics	3	41	8
VOCs	1	1	100
PAHs	1	1	100
TPH-DRO	1	1	100
SURFACE WATER			
Total Metals	1	4	25
Dissolved Metals	1	4	25
Inorganics	1	4	25

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion of ≤25% was applied for cases in which both the sample and sample duplicate concentration were greater

than two times the RL as the reporting limit. For field duplicate pairs where the sample or duplicate concentration was less than five times the reporting limits, the absolute difference between the sample and duplicate was compared to the criterion of two times the greater RL. For metals, the CLP was used as the RL for these concentration dependent evaluations. With a few exceptions, the applicable evaluation criterion was met. The exceptions and the resultant data qualifiers are summarized below.

5.1.1 Groundwater Field Duplicate Results

All field duplicate results were within evaluation criteria for groundwater samples, therefore, no qualifications of data were necessary.

5.1.2 Surface Water Field Duplicates Results

All field duplicate results were within evaluation criteria for surface water samples, therefore, no qualifications of data were necessary.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blanks are prepared in an identical manner to the samples with which they are associated. Rinsate blanks samples were prepared by pouring ASTM Type II water or laboratory supplied "reagent-free" water over decontamination sampling equipment and collecting the water in appropriate sample containers. Tables 5-3 and 5-4 summarize the rinsate blank samples associated with the samples collected during the December 2003 Groundwater and Surface water sampling event. The QAPP required frequency of 5% for the collection of rinsate blanks was met for the December 2003 sampling event.

Table 5-3
Rinsate Blanks Collected During the December, 2003 Sampling Event

Sample ID[1]	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics	VOCs[2]	PAHs[2]	TPH-DRO[2]
RB01T-GRW	Groundwater	WAT235A	x	x	x	x	x	x
RB02T-GRW	Groundwater	WAT233C	x	x	x			
RB03T-SFW	Groundwater	WAT233C	x	x	x			
RB01T-SFW	Surface water	WAT238S	x	x	x			

[1]The "T" in the field ID was changed to "D" for dissolved metals samples.
[2] These organic analyses were collected for a non-RI/FS purpose. As such, these methods are not included in the QAPP.

Table 5-4
Rinsate Blank Collection Frequency for the December, 2003 Sampling Event

Analyses	Number of RB samples	Total Samples	Percentage (%)
Groundwater			
Total Metals	3	41	7
Dissolved Metals	3	41	7
Inorganics	3	41	7
VOCs	1	1	100
PAHs	1	1	100
TPH-DRO	1	1	100
Surface Water			
Total Metals	1	4	25
Dissolved Metals	1	4	25
Inorganics	1	4	25

The rinsate blank detections results for groundwater and surface water and the resulting data qualification issued are summarized in Tables 5-5 and 5-6, respectively. To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration. As this approach was considered more appropriate than using a zero for the nondetect result which might bias the average low or biasing the average high by using the reporting limit.

5.2.1 Groundwater Rinsate Blanks

Table 5-5 summarizes the analytes detected in the associated RI/FS groundwater rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 5-5
Summary of Groundwater Rinsate Blank Results and Additional Qualifications

Sample ID	Sample ID	Conc.	Ave Conc	RL	Frequency of Detection	Range of Field Samples	Action
Total Metals (ug/L)							
Manganese	RB02T-GRW	14.4	23.5	12	1 of 3	10-44,400	All total manganese results < 117.5 ug/L were qualified as nondetect (U RB-I).
Zinc	RB02T-GRW	66	59.2	23	1 of 3	19-10,200	All total zinc results < 295.8 ug/L were qualified as nondetect (U RB-I).
Dissolved Metals (ug/L)							
Copper	RB02D-GRW	2.2	34.9	2.2	2 of 3	2-5,690	All dissolved copper results < 174.5 ug/L were qualified as nondetect (U RB-I).
	RB03D-GRW	2.4					
Inorganics (mg/L)							
Ammonia	RB01T-GRW	0.048	0.049	0.04	3 of 3	0.04-0.14	None of the ammonia results were greater than 5x the average rinsate blank concentration.
	RB02T-GRW	0.058					
	RB03T-GRW	0.041					

Table 5-5
Summary of Groundwater Rinsate Blank Results and Additional Qualifications

Sample ID	Sample ID	Conc.	Ave Conc	RL	Frequency of Detection	Range of Field Samples	Action
Chloride	RB01T-GRW	0.56	0.253	0.2	1 of 3	0.93-86.3	All chloride results < 1.27 mg/L were qualified as nondetect (U RB-I).
Fluoride	RB02T-GRW	0.14	0.080	0.1	1 of 3	0.24-60	All fluoride results < 0.4 mg/L were qualified as nondetect (U RB-I).
Orthophosphate	RB02T-GRW	0.01	0.007	0.01	1 of 3	0.01-0.14	All orthophosphate results < 0.035 mg/L were qualified as nondetect (U RB-I).
Total and Bicarbonate Alkalinity	RB01T-GRW	4.1	3.3	1	3 of 3	1-474	All total and bicarbonate alkalinity results < 16.5 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW	2.8					
	RB03T-GRW	2.9					
TDS	RB01T-GRW	6	11.7	5	3 of 3	88-4,210	All TDS results < 58.5 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW	6					
	RB03T-GRW	23					
TSS	RB01T-GRW	0.9	0.8	0.5	3 of 3	0.7-388	All TSS results < 4.0 mg/L were qualified as nondetect (U RB-I).
	RB02T-GRW	0.6					
	RB03T-GRW	1					

ND = Nondetect MDL = Method Detection Limit RL = Reporting Limit

[1] Criteria for qualification was based on 5x the average concentration found in the rinsate blanks.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

5.2.2 Surface Water Rinsate Blanks

Table 5-6 summarizes the analytes detected in the associated RI/FS surface water rinsate blank samples. Similarly, as with the groundwater rinsate blanks, this table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 5-6
Summary of Surface Water Rinsate Blank Results and Additional Qualifications

Sample ID	Sample ID	Conc.	Ave Conc	RL	Frequency of Detection	Range of Field Samples	Action
Dissolved Metals (ug/L)							
Copper	RB01D-SFW	2.4	2.4	1.7	1 of 1	1.7-38.3	All dissolved copper results <12.0 µg/L were qualified as nondetect (U RB-I).
Lead	RB01D-SFW	0.32	0.3	0.2	1 of 1	0.2-0.2	None of the dissolved lead results were greater than 5x the average rinsate blank concentration.
Inorganics (mg/L)							
Ammonia	RB01T-SFW	0.043	0.0	0.04	1 of 1	0.04-0.046	None of the ammonia results were greater than 5x the average rinsate blank concentration.
Total and Bicarbonate Alkalinity	RB01T-SFW	2.8	2.8	1	1 of 1	38.7-59.6	None, all samples concentrations were above the qualification threshold of 14.0 mg/L.
TDS	RB01T-SFW	22	22.0	5	1 of 1	224-322	None, all samples concentrations were above the qualification threshold of 110.0 mg/L.
TSS	RB01T-SFW	0.7	0.7	0.5	1 of 1	4.2-16.8	None, all samples concentrations were above the qualification threshold of 3.5 mg/L.

ND = Nondetect MDL = Method Detection Limit RL = Reporting Limit

[1]Criteria for qualification was based on 5x the average concentration found in the rinsate blanks.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

5.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field Blanks are generated by pouring laboratory-supplied reagent grade water into certified pre-cleaned sample containers, at the sample collection site. Tables 5-7 and 5-8 summarize the field blank samples associated with the samples collected during the December 2003 groundwater sampling event. Field blanks are only required to be collected by the project QAPP when samples are analyzed for organics (VOCs, PAHs, and TPH-DRO). Only one December 2003 sample, MMW-48A-T01N-GRW, was analyzed for organics. The results were reported in package WAT235A.

Table 5-7
Field Blanks Collected During the December, 2003 Sampling Event

Sample ID[1]	Matrix	Data Package	VOCs[1]	PAHs[1]	TPH-DRO[1]
FB01T-GRW	Groundwater	WAT235A	x	x	x

[1] These organic analyses were collected for a non-RI/FS purpose. As such, these methods are not included in the QAPP.

Table 5-8
Field Blank Collection Frequency for the December, 2003 Sampling Event

Analyses	Number of RB samples	Total Samples	Percentage (%)
Groundwater			
VOCs	1	1	100
PAHs	1	1	100
TPH-DRO	1	1	100

All of the VOCs, PAHs, and TPH-DRO groundwater field blank results were nondetect. Therefore, no qualifications of data were necessary.

With the exception of three results, all results for field samples are considered usable as qualified. The VOC 2-chloroethyl vinyl ether result for sample MMW-48A-T01N-GRW and its field duplicate were rejected due to a severely low matrix spike recovery. Similarly, the cyanide result for sample MMW-33A-T01N-GRW was rejected due to a low matrix spike recovery. Some sample results were qualified as nondetect on the basis of laboratory or rinsate blank contamination. In addition, some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summaries. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment for December 2003

Analysis Type	QC Measure	# of Analytes Measured	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	FD	57	57	100
	LD	57	57	100
Total metals	FD	75	75	100
	LD	75	75	100
Dissolved Metals	FD	75	75	100
	LD	75	75	100
VOCs	FD	84	84	100
	MS/MSD	166	153	92
PAHs	FD	25	25	100
	MS/MSD	50	50	100
TPH-DRO	FD	2	2	100
	MS/MSD	2	2	100
SURFACE WATER				
Inorganics	FD	19	19	100
	LD	19	19	100
Total Metal	FD	25	25	100
	LD	25	25	100
Dissolved Metals	FD	25	25	100
	LD	25	25	100

6.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Percent of MS (and MSD) recoveries meeting criteria are summarized in Table 6-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters.

Table 6-2
Summary of Accuracy Assessment for December 2003

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	MS	34	31	94
Total Metals	MS	52	51	98
Dissolved Metals	MS	51	51	100
VOCs	MS/MSD	168	153	91
SVOC	MS/MSD	50	50	100
TPH-DRO	MS/MSD	2	2	100
SURFACE WATER				
Inorganics	MS	14	13	92
Total Metals	MS	21	21	100
Dissolved Metals	MS	21	21	100

The overall level of accuracy, both analytical and combined analytical and sampling demonstrated is considered to be acceptable.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

There were forty-one groundwater and four surface water samples collected during the December 2003 sampling event. All groundwater samples yielded valid results for all target analytes with the exception of three results mentioned earlier in this section. Consequently, the overall completeness achieved for the groundwater field samples was 99.9%. All of the surface water samples yielded valid results for all target analytes, therefore the overall completeness was 100%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS,

2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the groundwater and surface water samples collected during the December 2003 sampling event. The close agreement between the field duplicate results, as discussed in Section 5.1, indicated that the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 4.2 indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. As such, obtaining some nondetect results with elevated reporting limits was not avoidable. While it is anticipated that all data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT232C

Sampling Event: December 2003 SFW/GRW

Matrix: Solid ___ Water X Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 4/12/04

Peer Reviewer: Stacey Coker

Date Completed: 4/20/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
MW-1-T01N-GRW	SA	554472		W	X	X
MW-1-D01N-GRW	SA	554473		W	X	
MW-9A-T01N-GRW	SA	554474		W	X	X
MW-9A-D01N-GRW	SA	554475		W	X	
MW-22-T01N-GRW	SA	554476		W	X	X
MW-22-D01N-GRW	SA	554477		W	X	
MW-23-T01N-GRW	SA	554478		W	X	X
MW-23-D01N-GRW	SA	554479		W	X	
MW-20-T01N-GRW	SA	554480		W	X	X
MW-20-D01N-GRW	SA	554481		W	X	
MW-17-T01N-GRW	SA	554482		W	X	X
MW-17-D01N-GRW	SA	554483		W	X	
MW-24-T01N-GRW	SA	554484		W	X	X
MW-24-D01N-GRW	SA	554485		W	X	
MW-25-T01N-GRW	SA	554486		W	X	X
MW-25-D01N-GRW	SA	554487		W	X	
MW-26-T01N-GRW	SA	554488		W	X	X
MW-26-D01N-GRW	SA	554489		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues were noted in the case narrative.

During the alkalinity analyses on 12/12/03, the continuing calibration verification standards designated CCV1 and CCV3 exhibited a percent recovery (111.5%) and (110.7%), respectively, slightly above the control criteria (90-110%). None of the samples in this SDG were bracketed by CCV3, however, all of the associated samples were bracketed by the affected CCV1; therefore all of the positive alkalinity results are qualified as estimated (J CCV-H).

During the TKN analysis on 11/18/03, the continuing calibration verification (CCV1) standard exhibited a percent recovery (87.5%) that was slightly below control criteria (90-110%). The analytical results from this analytical sequence were formally reported. All of the associated samples were bracketed by the affected CCV; therefore all of the TKN results are qualified as estimated (UJ/J CCV-L).

During the cyanide analysis from 12/12/03, the laboratory analyst inadvertently did not perform the post digestion spike for sample MW-1-T01N-GRW. However, the matrix spike associated with this sample exhibited an acceptable recovery, therefore, no qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 15 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, beryllium, boron, chromium, molybdenum, and potassium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS MW-1-T01N-GRW MW-1-D01N-GRW • LD MW-1-T01N-GRW MW-1-D01N-GRW	No	Matrix spike and post digestion spike analyses were conducted on samples MW-1-T01N-GRW and MW-1-D01N-GRW. All of the matrix spike results were inside acceptance limits. The post digestion spike results for silver were below the acceptance limit, but data qualification was not considered necessary because the silver matrix spike recoveries were acceptable. Laboratory duplicates (LD) analyses were conducted on samples MW-1-T01N-GRW and MW-1-D01N-GRW. As noted in the case narrative, the relative percent differences (RPD) for ammonia and TKN exceeded the laboratory control criteria. However, the RPD was not the appropriate evaluation criteria and duplicate results for these analytes did meet the criteria outlined in the RI/FS QAPP. The matrix quality control results for the December 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MW-1-T01N-GRW MW-1-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the matrix spike samples for MW-1-T01N-GRW and MW-1-D01N-GRW, pH class C. Serial dilution results for sample MW-1-T01N-GRW was applicable for 14 out of 24 metals and MW-1-D01N-GRW was applicable for 11 out of 24 metals each. For sample MW-1-T01N-GRW, the percent difference between the original result and result for the diluted sample for lead, thallium, and vanadium did not satisfy the ≤10% criterion and the results for this sample were qualified as estimated. Also, for sample MW-1-D01N-GRW, the percent difference between the original result and result for the diluted sample for antimony, silver, thallium, vanadium, and zinc did not satisfy the ≤10% criterion and the results for this sample were qualified as estimated. Table 1.3 summarizes these results. The serial dilution results for the December 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. Recovery for internal standard Li was high for the ICPMS analysis of sample MW-25-T01N-GRW. Therefore, potassium results for all samples were reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recoveries for internal standard Sc were high for the ICPMS analysis for MW-1-T01N-GRW and MW-1-D01N-GRW. Therefore, aluminum, boron, chromium, and zinc results for all samples were reported from the trace ICP. The trace ICP aluminum, boron, chromium, and zinc reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. However, the laboratory did not report selenium and vanadium results from the trace ICP. Since the internal standard recoveries were only slightly high, the selenium and vanadium results for sample MW-1-T01N-GRW were qualified as estimated (J/UJ IS-I). For samples MW-22-T01N-GRWand MW-23-T01N-GRW the analysis of orthophosphate exceeded that of the total phosphorus analysis beyond variation expected due to the accuracy limitations of the method. Orthophosphate and phosphorus results for these samples were qualified as estimated (J/UJ TVP-I).
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package did not include any site-specific field quality control samples. The field quality control results for the December 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
MW-1-T01N-GRW	0.97 J	0.005 UJ	0.019 J	986 J	7.2 J
MW-9A-T01N-GRW	0.56 J	0.005 UJ	0.015 J	1110 J	7.3 J
MW-22-T01D-GRW	0.54 J	0.005 UJ	0.068 J	189 J	8.0 J
MW-23-T01N-GRW	1.1 J	0.005 UJ	0.05 J	379 J	8.0 J
MW-20-T01N-GRW	---	0.005 UJ	0.025 J	354 J	7.6 J
MW-17-T01N-GRW	0.34 J	0.005 UJ	0.01 UJ	555 J	7.6 J
MW-24-T01N-GRW	---	0.005 UJ	0.017 J	286 J	7.5 J
MW-25-T01N-GRW	---	0.005 UJ	0.029 J	224 J	8.1 J
MW-26-T01N-GRW	---	0.005 UJ	0.14 J	1060 J	7.2 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB7 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=10		-35.8	-42.0	-49.8			-41.27	30.7	All the samples in this SDG.	UJ/J CCB, MB-L
Antimony (MS) DF=2			0.9	0.9	0.9	1.0		0.5	MW-1-T01N-GRW	U CCB-I
Beryllium (P) DF=1	0.9	0.7	0.9	1.5			0.696	0.3	All samples in this SDG except MW-22-D01N-GRW	U CCB, MB-I
Boron (P) DF=1				9.0				6.4	MW-24-T01N-GRW, MW-24-D01N-GRW, MW-25-T01N-GRW, MW-25-D01N-GRW, MW-26-T01N-GRW, MW-26-D01N-GRW	U CCB-I
Chromium (P) DF=1	-2.0	-2.2	-2.0	-2.0			-1.614	1.3	All samples in this SDG.	UJ/J CCB, MB-L
Molybdenum (P) DF=1		-1.8	-2.3				-1.806	1.2	MW-9A-T01N-GRW, MW-9A-D01N-GRW, MW-22-T01N-GRW, MW-22-D01N-GRW, MW-23-T01N-GRW, MW-23-D01N-GRW, MW-20-T01N-GRW, MW-20-D01N-GRW, MW-24-T01N-GRW, MW-24-D01N-GRW, MW-25-D01N-GRW	UJ/J CCB, MB-L or UJ/J CCB-L
Potassium (P) DF=1	-1359	-1432	-1698	-2815			-2138	521.7	All samples in this SDG.	UJ/J CCB, MB-L

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank DL = Instrument Detection Limit RL=

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
MW-1-T01N-GRWSL			
Arsenic	12.7	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	The parent sample was nondetect, therefore no qualification was required for a high bias.
Lead	10.4		The serial dilution result rounds to 10%. Therefore no qualification was considered necessary.
Vanadium	12.7		Qualify parent sample J DL-H
MW-1-D01N-GRWSL			
Antimony	20.3	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	The parent sample was nondetect, therefore no qualification was required for a high bias.
Arsenic	16.5		
Lead	22.3		
Silver	22.8		
Thallium	21.8		
Vanadium	19.7		Qualify parent sample J DL-H
Zinc	13.8		Qualify parent sample UJ DL-L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT233C

Sampling Event: December 2003 SFW/ GRW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike

Date Completed: 04/01/04

Peer Reviewer: Stacey Coker

Date Completed: 04/19/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
MW-21-T01N-GRW	SA	554607		W	X	X
MW-21-D01N-GRW	SA	554608		W	X	
MMW-31B-T01N-GRW	SA	554609		W	X	X
MMW-31B-D01N-GRW	SA	554610		W	X	
RB02T-GRW	RB	554611		W	X	X
RB02D-GRW	RB	554612		W	X	
MMW-44B-T01N-GRW	SA	554613		W	X	X
MMW-44B-D01N-GRW	SA	554614		W	X	
MMW-42B-T01N-GRW	SA	554615		W	X	X
MMW-42B-D01N-GRW	SA	554616		W	X	
MW-28-T01N-GRW	SA	554891		W	X	X
MW-28-D01N-GRW	SA	554892		W	X	
MW-28-T01D-GRW	FD	554893		W	X	X
MW-28-D01D-GRW	FD	554894		W	X	
MW-29-T01N-GRW	SA	554895		W	X	X
MW-29-D01N-GRW	SA	554896		W	X	
MW-27-T01N-GRW	SA	554897		W	X	X
MW-27-D01N-GRW	SA	554898		W	X	
RB03T-GRW	RB	554899		W	X	X
RB03D-GRW	RB	554900		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

As noted in the case narrative, the alkalinity analyses of the calibration check standards designated CCV#1 and CCV#3 from the 12/12/03 analysis yielded marginally elevated percent recoveries. Therefore, positive total alkalinity and bicarbonate alkalinity results for samples RB02T-GRW, MW-21-T01N-GRW, MMW31B-T01N-GRW, MMW-44B-T01N-GRW and MMW-42B-T01N-GRW were qualified as estimated (**J CCV-H**). The results from this analytical sequence were formally presented.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding times for pH and conductivity analyses were exceeded between 2 and 8 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony, boron, lead, mercury, molybdenum, potassium and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for December 2003 SFW/ GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MW-21-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on sample MW-21-T01N-GRW was not applicable for 23 of the 24 metal analytes, as only one analyte exhibited an initial concentration in excess of 50 times the IDL. The percent difference between the original result and its five fold dilution was compared to an evaluation criterion of ± 10%. The result was within evaluation criteria, therefore, no qualifications of data were necessary. The serial dilution results for the December 2003 SFW/ GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for groundwater samples. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-31B-T01N-GRW and MMW-31B-D01N-GRW. Therefore, beryllium and molybdenum results for all samples were reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample MW-27-T01N-GRW the analysis of orthophosphate exceeded that of the total phosphorus analysis beyond variation expected due to the accuracy limitations of the method. Orthophosphate and phosphorus results for this sample was qualified as estimated (J TVP-I). Table 1.3 summarizes these results and the data qualification. The laboratory-generated cation/ anion balances were compared against an evaluation criterion of ± 13% to assess the usability of the data. All reported cation/ anion balances met this criterion and therefore did not require qualification. The ratios of the calculated to measured TDS were within 0.5 and 1.5 for all field samples.
Field QC • Field Duplicate (FD) MW-28-T01N-GRW MW-28-T01D-GRW MW-28-D01N-GRW MW-28-D01D-GRW	Yes	All field duplicate results were within evaluation criteria, therefore, no qualifications of data were necessary. The field quality control results for the December 2003 SFW/ GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
• Rinsate Blank (RB) RB02T-GRW RB02D-GRW RB03T-GRW RB03D-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)		There were a few detections detections in the rinsate blank (RB) samples. Rinsate blank detections will be evaluated collectively and resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH
RB02T-GRW	23.8 J	6.7 J
MW-28-T01N-GRW	1200 J	7.1 J
MW-28-T01D-GRW	1200 J	7.1 J
RB03T-GRW	3.3 J	6.8 J
MW-21-T01N-GRW	1010 J	7.4 J
MMW-31B-T01N-GRW	2500 J	6.7 J
MMW-44B-T01N-GRW	2430 J	6.4 J
MMW-42B-T01N-GRW	2390 J	6.9 J
MW-29-T01N-GRW	1420 J	7.3 J
MW-27-T01N-GRW	328 J	7.6 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony DF=2	1.4	1.3	7.1	---	---	1.2	MW-21-T01N-GRW	U CCB-I
Boron DF=1	6.7	---	---	6.7	---	6.3	MMW-31B-D01N-GRW MMW-31B-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW MW-27-D01N-GRW MW-27-T01N-GRW	U CCB-I
Lead DF=1	---	---	---	---	-1.430	1.4	MW-28-D01D-GRW MW-28-D01N-GRW MW-28-T01D-GRW MW-28-T01N-GRW RB02D-GRW RB02T-GRW RB03D-GRW RB03T-GRW MMW-42B-D01N-GRW MMW-42B-T01N-GRW MMW-44B-D01N-GRW MMW-44B-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW MW-27-D01N-GRW MW-29-D01N-GRW MW-29-T01N-GRW MW-27-T01N-GRW	UJ MB-L J MB-L
Mercury DF=1	---	---	-0.10	---	---	0.1	MMW-44B-T01N-GRW MMW-44B-D01N-GRW MMW-42B-T01N-GRW MMW-42B-D01N-GRW MW-28-T01N-GRW MW-28-D01N-GRW MW-28-T01D-GRW MW-28-D01D-GRW MW-29-T01N-GRW MW-29-D01N-GRW MW-27-T01N-GRW MW-27-D01N-GRW RB03T-GRW RB03D-GRW	UJ CCB-L
Molybdenum DF=1	---	---	1.9	---	1.117	1.1	MW-21-D01N-GRW MW-21-T01N-GRW MW-27-D01N-GRW MW-27-T01N-GRW	U MB-I U CCB, MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Potassium DF=1	---	881.5	496.9	---	---	318.0	MW-28-D01D-GRW MW-28-D01N-GRW MW-28-T01D-GRW MW-28-T01N-GRW RB02D-GRW RB02T-GRW RB03D-GRW RB03T-GRW MMW-31B-D01N-GRW MMW-31B-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW MW-27-D01N-GRW MW-27-T01N-GRW MW-29-D01N-GRW MW-29-T01N-GRW	U CCB-I
Sodium DF=10	---	502.9	683.3	---	570.3	453.8	RB02D-GRW RB02T-GRW RB03D-GRW MMW-31B-D01N-GRW MW-27-D01N-GRW MW-27-T01N-GRW	U CCB, MB-I

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications

Sample/Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
MW-27-T01N-GRW				
Orthophosphate vs. phosphorus	0.041	0.01	Absolute difference >2x RL (0.02)	UJ/J TvP-I for sample

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT234A Sampling Event: December 2003 SFW/ GRW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike Date Completed: 04/02/04

Peer Reviewer: Stacey Coker Date Completed: 04/13/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
MMW-17B-T01N-GRW	SA	554623		W	X	X
MMW-17B-D01N-GRW	SA	554624		W	X	
MMW-17A-T01N-GRW	SA	554625		W	X	X
MMW-17A-D01N-GRW	SA	554626		W	X	
MMW-45B-T01N-GRW	SA	554627		W	X	X
MMW-45B-D01N-GRW	SA	554628		W	X	
MMW-44A-T01N-GRW	SA	554629		W	X	X
MMW-44A-D01N-GRW	SA	554630		W	X	
MMW-47A-T01N-GRW	SA	554631		W	X	X
MMW-47A-D01N-GRW	SA	554632		W	X	
MMW-47A-T01D-GRW	FD	554633		W	X	X
MMW-47A-D01D-GRW	FD	554634		W	X	
MMW-45A-T01N-GRW	SA	554635		W	X	X
MMW-45A-D01N-GRW	SA	554636		W	X	
MMW-45A-T01D-GRW	FD	554637		W	X	X
MMW-45A-D01D-GRW	FD	554638		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

The original TDS analysis of sample MMW-44A-T01N-GRW, which was analyzed within holding time, yielded a net weight after drying that greatly exceeded the upper limit of the method. The sample was re-

analyzed using a smaller sample volume outside of holding time yielding results comparable to the original analysis. The result from the original analysis was formally presented, no qualifications of data were necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding times for pH and conductivity analyses were exceeded between 2 and 10 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Arsenic, boron, beryllium, chromium, iron, nickel, molybdenum, potassium, sodium and zinc were detected in various blanks. No qualifications of arsenic data were necessary since all associated sample concentrations were nondetect. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for December 2003 SFW/ GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-17B-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on sample MMW-17B-T01N-GRW was not applicable for any of the 24 metal analytes. No qualifications of data were necessary. The serial dilution results for the December 2003 SFW/ GRW sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for groundwater samples. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-45B-T01N-GRW, MMW-45B-D01N-GRW, MMW-44A-T01N-GRW, MMW-44A-D01N-GRW, MMW-45A-T01N-GRW, MMW-45A-D01N-GRW and MMW-45A-T01D-GRW. Therefore, beryllium and molybdenum results for all samples were reported from the trace ICP. The trace ICP molybdenum and beryllium reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample MMW-47A-T01D-GRW the analysis of orthophosphate exceeded that of the total phosphorus analysis beyond variation expected due to the accuracy limitations of the method. Orthophosphate and phosphorus results for this sample was qualified as estimated (J TVP-I). For sample MMW-17B-D01N-GRW the analysis of dissolved aluminum exceeded that of the total aluminum. The dissolved aluminum and total aluminum result for this sample were qualified as estimated (J TVP-I) Table 1.3 summarizes these results and the data qualification. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exceptions of MMW-17A-T01N-GRW (14.59), MMW-17B-T01N-GRW (15.64) and MMW-44A-T01N-GRW (14.88). The laboratory case narrative notes that the results were compared with historical data and the reviewer verified the reported ion balance numbers. For samples MMW-44A-T01N-GRW and MMW-17A-T01N-GRW, the recalculation of the balance, using ½ of the reporting limit for Ca^{2+}, which contributed significantly to the imbalances resulted in cation/anion balance of 8.17% and 3.33% respectively. As such, the slight imbalance was due to elevated reporting limits for nondetect cations and data qualification was not necessary. For sample MMW-17B-T01N-GRW, the cation/anion balance was recalculated independently and the percent difference was calculated as 11.11% which did not require qualification. No qualification was considered necessary. The ratios of the calculated to measured TDS results were within 0.5 and 1.5 for all field samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) MMW-47A-T01N-GRW MMW-47A-T01D-GRW MMW-47A-D01N-GRW MMW-47A-D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	All field duplicate results were within evaluation criteria, therefore, no qualifications of data were necessary. The field quality control results for the December 2003 SFW/ GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH
MMW47A-T01N-GRW	793 J	4.6 J
MMW-45A-T01N-GRW	1350 J	3.9 J
MMW-45A-T01D-GRW	1380 J	3.9 J
MMW-17B-T01N-GRW	653 J	5.2 J
MMW-17A-T01N-GRW	628 J	4.7 J
MMW-45B-T01N-GRW	2100 J	4.0 J
MMW-44A-T01N-GRW	2970 J	3.6 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Boron DF=10	---	-11.3	-9.1	---	-6.6	---	6.4	All results in this data set	UJ CCB-L
Chromium DF=100	2.4	---	---	---	---	---	1.1	MMW-17B-D01N-GRW	U CCB-I
Iron DF=100	28.6	---	---	---	---	---	27.8	MMW-17B-D01N-GRW	U CCB-I
Molybdenum DF=10	---	---	---	-1.4	---	-1.117	1.1	All results in this data set	UJ MB-L
Nickel DF=100	3.6	---	---	---	---	---	2.4	MMW-17A-D01N-GRW MMW-17A-T01N-GRW MMW-17B-D01N-GRW MMW-17B-T01N-GRW MMW-45B-D01N-GRW MMW-45B-T01N-GRW	U CCB-I
Potassium DF=100	---	387.2	---	---	---	---	318.0	MMW-17B-T01N-GRW MMW-45B-T01N-GRW	U CCB-I
Sodium DF=100	---	463.2	---	---	---	---	453.8	MMW-45A-T01N-GRW MMW-47A-D01D-GRW MMW-47A-D01N-GRW MMW-17B-T01N-GRW MMW-44A-D01N-GRW MMW-45B-D01N-GRW	U CCB-I
Zinc DF=100	---	---	---	---	---	3.232	2.3	MMW-17A-D01N-GRW MMW-17A-T01N-GRW MMW-17B-D01N-GRW MMW-17B-T01N-GRW	U MB-I

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications

Sample/Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
MW-47A-T01D-GRW				
Orthophosphate vs. phosphorus	0.147	0.01	Absolute difference >2x RL (0.02)	UJ/J TvP-I
MMW-17B-D01N-GRW				
Dissolved Aluminum vs Total Aluminum	5,500	2,210	Absolute difference >2x RL (0.02)	UJ/J TvP-I

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT235A Sampling Event: December 2003 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike Date Completed: 4/2/04

Peer Reviewer: Stacey Coker Date Completed: 4/8/03

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses				
					VOC (8260)	SVOC (8270)	TPH-DR (8015)	Metals	Inorganic
MMW-48A-T01N-GRW	SA, MS, MSD	554729	48AT1NGRW MMW48AT01 8AT01NGRW	W	X	X	X	X	X
MMW-48A-D01N-GRW	SA	54730		W				X	
MMW-48A-T01D-GRW	FD	554731	MMW48AT1DGRW MW48AT01DGRW MMW48AT01DGRW	W	X	X	X		
RB01T-GRW	RB	554732		W	X	X	X	X	X
RB01D-GRW	RB	554733		W				X	
FB01T-GRW	FB	554734		W	X	X	X		
TB350-GRW	TB	554735		W	X				

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate RB = Rinsate Blank TB = Trip Blank MS = Matrix Spike

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

The metals analysis of the continuing calibration check standard CCV3 yielded percent recovery for arsenic (110.7%). Since all associated samples were nondetect, no qualifications of data were necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding times for pH and conductivity analyses were exceeded by 2 and 10 days, respectively. For DRO and PAH analyses, sample MMW-48A-T01D-GRW was extracted three days beyond the holding time specified in the QAPP. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, arsenic, boron, beryllium, chromium, iron, molybdenum, mercury, potassium, sodium and were detected in various blanks. No qualifications of boron data were necessary since all associated sample concentrations were nondetect. No qualifications were necessary for antimony, arsenic, sodium and zinc results since the blank samples in which there were detections were not associated with any project specific samples. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD MMW-48A-T01N-GRW • LD	No	For sample MMW-48A-T01N-GRW, several VOC matrix spike recoveries were outside evaluation criteria. Table 1.3 summarizes the outlying recoveries and the resultant data qualifications. The matrix quality control results for December 2003 groundwater sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-48A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on sample MMW-48A-T01N-GRW was not applicable for 22 of the 24 metal analytes, as only two analytes exhibited an initial concentration in excess of 50 times the IDL. The percent difference between the original result and it's five fold dilution was compared to an evaluation criterion of $\leq$ 10%. All results were within evaluation criteria, therefore, no qualifications of data were necessary. The serial dilution results for the December 2003 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for groundwater samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of $\pm$ 13% to assess the usability of the data. All reported cation/anion balances met this criterion and therefore did not require qualification. The ratios of the calculated TDS for all field samples were within 0.5 and 1.5.
Field QC • Field Duplicate (FD) MMW-48A-T01N-GRW MMW-48A-T01D-GRW • Rinsate Blank (RB) RB01T-GRW RB01D-GRW • Field Blank (FB) FB01T-GRW • Trip Blank (TB) TB350-GRW • Other (e.g., splits)	Yes	All field duplicate results were within evaluation criteria, therefore, no qualifications of data were necessary. There were a few detections in the rinsate blank (RB) samples. Rinsate blank and field blank detections will be evaluated collectively and resultant data qualification will be summarized in the overall assessment. All trip blank results were nondetect, therefore, no qualifications of data were necessary. The field quality control results for the December 2003 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	TPH-DRO	PAH (8270)	Conductivity (umhos/cm)	pH
MMW-48A-T01N-GRW			2980 J	5.4 J
RB01T-GRW			0.51 J	5.6 J
MMW-48A-T01D-GRW	J/UJ for all results	J/UJ for all results		

Table 1.2
Metals Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	CCB7 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum DF=100	---	---	56.5	123.0	143.0	---	---	---	30.7	MMW-48A-D01N-GRW	U CCB-I
Beryllium DF=10	1.5	1.2	2.5	1.7	1.9	---	---	---	0.3	MMW-48A-T01N-GRW RB01D-GRW RB01T-GRW MMW-48A-D01N-GRW	U CCB-I
Chromium DF=100	---	-3.4	-1.3	---	---	---	---	---	1.3	MMW-48A-T01N-GRW RB01D-GRW RB01T-GRW MMW-48A-D01N-GRW	UJ CCB-L
Copper DF=100	-3.9	-6.9	-8.2	-3.5	-4.6	---	---	---	2.0	MMW-48A-T01N-GRW MMW-48A-D01N-GRW RB01T-GRW RB01D-GRW	UJ CCB-L
Iron DF=100	---	-50.5	---	78.1	75.5	---	---	---	30.0	RB01D-GRW RB01T-GRW	UJ CCB-L
Molybdenum DF=10	---	---	2.0	9.7	3.1	---	---	-1.282	1.2	MMW-48A-T01N-GRW RB01D-GRW RB01T-GRW MMW-48A-D01N-GRW	UJ MB-L
Potassium DF=100	-2044.0	-1751.0	-804.0	-2040.0	---	---	---	-1340.0	521.7	MMW-48A-T01N-GRW RB01D-GRW RB01T-GRW MMW-48A-D01N-GRW	UJ CCB, MB-L
Mercury	---	---	-0.1	---	---	---	-.01	---	0.10	RB01D-GRW	UJ CCB-L

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Recoveries Not Meeting Criteria

Sample/Analytes	Matrix Spike Recovery	Matrix Spike Duplicate Recovery	Acceptance Ranges	Action
MMW-48A-T01N-GRW				
2-Chloroethyl Vinyl Ether	0	0	60-140	Qualified parent sample as R MS-L
Styrene	47	45	80-124	Qualified parent sample as UJ MS-L
Bromoform	81	80	82-120	Qualified parent sample as UJ MS-L
m,p-Xylene	80	75	78-116	Qualified parent sample as UJ MS-L
o-Xylene	82	80	81-125	Qualified parent sample as UJ MS-L
1,3,5-Trimethylbenzene	72	68	72-112	Qualified parent sample as UJ MS-L
1,1,2,2-Tetrachloroethane	110	110	74-108	None, all associated sample results were nondetect
2-Chlorotoluene	110	100	73-107	None, all associated sample results were nondetect

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT236A Sampling Event: December 2003 SFW/ GRW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike Date Completed: 04/03/04

Peer Reviewer: Stacey Coker Date Completed: 03/13/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
MMW-33A-T01N-GRW	SA, MS,LD	554983		W	X	X
MMW-33A-D01N-GRW	SA, MS, LD	554984		W	X	
SPRING13PUMP-T01N-GRW	SA, MS, LD	554985		W	X	X
SPRING13PUMP-D01N-GRW	SA, MS, LD	554986		W	X	
GWW-1-T01N-GRW	SA	554987		W	X	X
GWW-1-D01N-GRW	SA	554988		W	X	
GWW-2-T01N-GRW	SA	554989		W	X	X
GWW-2-D01N-GRW	SA	554990		W	X	
GWW-3-T01N-GRW	SA	554991		W	X	X
GWW-3-D01N-GRW	SA	554992		W	X	
SPRING39PUMP-T01N-GRW	SA	554993		W	X	X
SPRING39PUMP-D01N-GRW	SA	554994		W	X	
MMW-29A-T01N-GRW	SA	554995		W	X	X
MMW-29A-D01N-GRW	SA	554996		W	X	
MMW-10A-T01N-GRW	SA	554997		W	X	X
MMW-10A-D01N-GRW	SA	554998		W	X	
MMW-49A-T01N-GRW	SA	554999		W	X	X
MMW-49A-D01N-GRW	SA	555000		W	X	
SPRING13-T01N-GRW	SA	555001		W	X	X
SPRING13-D01N-GRW	SA	555002		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample LD = Laboratory Duplicate MS = Matrix Spike

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

During the original TDS analyses of the samples in this SDG, which was accomplished within holding time, the associated LCS analysis yielded a percent recovery that greatly exceeded the evaluation criteria at 400%. The laboratory re-analyzed the associated samples beyond the analytical holding time, which yielded comparable results. The results from the original analyses were formally presented. Consequently, the TDS results were qualified as estimated (J LCS – H). A comparison of the original results to the reanalysis results indicates that the magnitude of the high bias is ≤10%.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding times for pH and conductivity analyses were exceeded between 2 and 7 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, arsenic, beryllium, cadmium, chromium, copper, iron, molybdenum, nickel, potassium, sodium, vanadium and zinc were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD MMW-33A-T01N-GRW MMW-33A-D01N-GRW SPRING13PUMP-T01N-GRW SPRING13PUMP-D01N-GRW • LD MMW-33A-T01N-GRW MMW-33A-D01N-GRW SPRING13PUMP-T01N-GRW SPRING13PUMP-D01N-GRW	No	For matrix spike sample MMW-33A-T01N-GRW, the cyanide and TKN recoveries were outside evaluation criteria. For matrix spike sample SPRING13PUMP-T01N-GRW, the cyanide recovery was outside evaluation criteria. Table 1.3 summarizes the analytes recovered outside the acceptance range of 75-125% and the resultant data qualifications. The matrix quality control results for December 2003 SFW/ GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-33A-T01N-GRWSL MMW-33A-D01N-GRWSL SPRING13PUMP-T01N-GRWSL SPRING13PUMP-D01N-GRWSL • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the matrix spikes of samples MMW-33A-T01N-GRW, MMW-33A-D01N-GRW, SPRING13PUMP-T01N-GRW and SPRING13PUMP-D01N-GRW. For all four serial dilution samples, 22 out of 24 analytes were not applicable. The percent difference between the original result and its five fold dilution was compared to an evaluation criterion of ± 10%. For samples MMW-33A-T01N-GRW and SPRING13PUMP-D01N-GRW, the percent difference between the original result and result for the diluted sample for molybdenum did not satisfy the ≤10% criterion and the results for these samples were qualified as estimated. Table 1.4 summarizes the outlying serial dilutions and the resultant data qualification. The serial dilution results for the December 2003 SFW/ GRW sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for groundwater samples. The laboratory-generated anion/cation balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exceptions of GWW-1-T01N-GRW (14.2%). The reviewer verified the reported ion balance numbers. Four of the cation concentrations contributing to the calculation of this balance (Ca^{2+}, K^{+}, Na^{+}, and Al^{3+}) were not detected above the instrument detection limit (IDL) and were therefore reported at the detection limit. Recalculation of the balance, using ½ of the reporting limit for Ca^{2+}, which contributed significantly to the imbalances resulted in

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		cation/anion balance of 6.27%. As such the reporting limits for nondetect results limits controlled the calculations. The balances were therefore not an appropriate measure of accuracy. No qualification was considered necessary.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any site-specific field quality control samples. The field quality control results for the December 2003 SFW/ GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH
MMW-33A-T01N-GRW	1410 J	4.5 J
SPRING13PUMP-T01N-GRW	1500 J	3.9 J
GWW-1-T01N-GRW	1270 J	4.5 J
GWW-2-T01N-GRW	1720 J	4.4 J
GWW-3-T01N-GRW	1550 J	4.4 J
SPRING39PUMP-T01N-GRW	1610 J	4.7 J
MMW-29A-T01N-GRW	1240 J	4.7 J
MMW-10A-T01N-GRW	1940 J	4.4 J
MMW-49A-T01N-GRW	1440 J	4.4 J
SPRING13-T01N-GRW	1870 J	3.9 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Arsenic DF=10	---	---	---	5.7	---	---	---	3.5	SPRING13-D01N-GRW SPRING13-T01N-GRW	U CCB-I
Beryllium DF=10	0.8	0.7	0.6	0.5	-0.7	-0.4	1.777	0.3	GWW-1-D01N-GRW GWW-1-T01N-GRW GWW-2-D01N-GRW GWW-2-T01N-GRW GWW-3-D01N-GRW GWW-3-T01N-GRW MMW-33A-D01N-GRW MMW-33A-T01N-GRW SPRING13PUMP-T01N-GRW SPRING39PUMP-D01N-GRW SPRING39PUMP-T01N-GRW MMW-10A-D01N-GRW MMW-10A-T01N-GRW MMW-29A-D01N-GRW MMW-29A-T01N-GRW MMW-49A-D01N-GRW MMW-49A-T01N-GRW SPRING13-D01N-GRW SPRING13-T01N-GRW SPRINGPUMP-D01N-GRW	U CCB, MB-I UJ CCB, MB-L U MB-I
Chromium DF=100	-2.6	-2.2	-1.9	-2.0	---	---	---	1.1	SPRING13PUMP-D01N-GRW	UJ CCB-L
Copper DF=100 ICP-6	---	-3.4	---	---	---	---	---	2.2	SPRING13PUMP-D01N-GRW	UJ CCB-L
Copper DF=100 ICP-5	---	---	-6.9	---	---	---	---	2.3	SPRING13PUMP-T01N-GRW GWW-1-T01N-GRW GWW-1-D01N-GRW GWW-2-T01N-GRW GWW-2-D01N-GRW GWW-3-T01N-GRW GWW-3-D01N-GRW SPRING39PUMP-T01N-GRW SPRING39PUMP-D01N-GRW	J CCB-L
Molybdenum DF=10 ICP 4	-3.5	-2.1	---	1.7	---	---	---	1.1	SPRING13PUMP-D01N-GRW	UJ CCB-L
Molybdenum DF=10 ICP 6	---	---	---	2.0	---	-1.2	---	1.2	GWW-1-D01N-GRW GWW-1-T01N-GRW GWW-2-T01N-GRW GWW-3-D01N-GRW GWW-3-T01N-GRW MMW-29A-D01N-GRW	U CCB-I
Nickel DF=100	-12.3	-10.8	-10.9	11.4	---	---	---	2.4	SPRING13PUMP-D01N-GRW	UJ CCB-L
Potassium DF=100	776.8	---	-567.7	-559.5	---	---	---	318.0	SPRING13PUMP-D01N-GRW	UJ CCB-L
Sodium DF=100	-957.0	-1068.0	-727.2	-578.3	---	---	---	453.8	SPRING13PUMP-D01N-GRW	UJ CCB-L
Vanadium DF=10	0.4	0.3	0.3	0.6	0.5	---	3.548	0.2	GWW-1-D01N-GRW GWW-1-T01N-GRW GWW-2-T01N-GRW GWW-3-D01N-GRW GWW-3-T01N-GRW MMW-10A-D01N-GRW MMW-10A-T01N-GRW MMW-29A-D01N-GRW MMW-33A-D01N-GRW MMW-33A-T01N-GRW MMW-49A-D01N-GRW MMW-49A-T01N-GRW SPRING13PUMP-D01N-GRW	U CCB, MB-I
Zinc DF-100	-8.2	-8.1	-8.2	-8.5	---	---	---	2.3	SPRING13PUMP-D01N-GRW	J CCB-L

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	Criteria	Qualification Codes
MMW-33A-T01N-GRW			
TKN	65	75-125%	UJ MS-L for parent sample.
Cyanide	0	75-125%	R MS-L for parent sample.
Nickel	164.8	75-125%	No Qualification necessary because the sample concentration was nondetect.
MMW-33A-D01N-GRW			
Nickel	158.9	75-125%	No Qualification necessary because the sample concentration was nondetect.
SPRING13PUMP-T01N-GRW			
Cyanide	28.4	75-125%	UJ MS-L for parent sample.
Arsenic	175.9	75-125%	No Qualification necessary because the sample concentration was nondetect.
Nickel	135.5	75-125%	No Qualification necessary because the sample concentration was nondetect.
Zinc	125.3	75-125%	No Qualification necessary because the percent recovery rounds to 125%.
SPRING13PUMP-D01N-GRW			
Arsenic	155.4	75-125%	No Qualification necessary because the sample concentration was nondetect.
Cadmium	65.0	75-125%	UJ MS-L for parent sample.
Chromium	28.6	75-125%	R MS-L for parent sample
Nickel	0.0	75-125%	R MS-L for parent sample

Table 1.4
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
MMW-33A-T01N-GRW			
Molybdenum	12.5	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample UJ DL-L
SPRING13PUMP-T01N-GRW			
Molybdenum	12.6	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample UJ DL-L

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT237C Sampling Event: December 2003 SFW/ GRW

Matrix: Solid ___ Water X Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike Date Completed: 04/06/04

Peer Reviewer: Stacey Coker Date Completed: 04/14/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
SUMP5000-T01N-GRW	SA	555003		W	X	X
SUMP5000-D01N-GRW	SA	555004		W	X	
LOWERSPRING13-T01N-GRW	SA	555005	LOWERSPRING13-T01N-G	W	X	X
LOWERSPRING13-D01N-GRW	SA	555006	LOWERSPRING13-D01N-G	W	X	
COLUMBINECANYON-T01N-GRW	SA	555007	COLUMCANYON-T01N-G COLUMCANYON-T01N-GRW	W	X	X
COLUMBINECANYON-D01N-GRW	SA	555008	COLUMCANYON-D01N-G COLUMCANYON-D01N-GRW	W	X	
MMW-28A-T01N-GRW	SA	555009		W	X	X
MMW-28A-D01N-GRW	SA	555010		W	X	
CC1A-T01N-GRW	SA	555011		W	X	X[3]
CC1A-D01N-GRW	SA	555012		W	X	
CC1B-T01N-GRW	SA	555013		W	X	X
CC1B-D01N-GRW	SA	555014		W	X	
CC2A-T01N-GRW	SA	555015		W	X	X
CC2A-D01N-GRW	SA	555016		W	X	
CC2B-T01N-GRW	SA	555017		W	X	X
CC2B-D01N-GRW	SA	555018		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 characters. In this table, the modified IDs are listed under the Laboratory Form Field ID.

[3]Limited inorganics due to limited sample volume

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

During the original TDS analyses of the samples in this SDG, which was accomplished within holding time, the associated LCS analysis yielded a percent recovery that greatly exceeded the evaluation criteria at 400%. The laboratory re-analyzed the associated samples beyond the analytical holding time and the results obtained were generally comparable with one exception. The re-analysis of sample COLUMBINECANYON-T01N-GRW yielded a result that was lower than the original, which resulted in an elevated ratio of calculated versus measured TDS. The results from the original analyses were formally presented. Consequently, all TDS results were qualified as estimated (J LCS – H). The magnitude of the high bias is expected to be ≤10%.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding times for pH and conductivity analyses were exceeded between 2 and 15 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Boron, cadmium, chromium, copper, molybdenum, potassium and vanadium were detected in various blanks. No qualifications of cadmium and copper data were necessary since all associated sample concentrations were not associated with the detected CCB. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for December 2003 SFW/GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution SUMP5000-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis conducted on sample SUMP5000-T01N-GRW was not applicable for 13 of the 24 metal analytes, as 9 analytes exhibited an initial concentration in excess of 50 times the IDL. The percent difference between the undiluted and diluted results was compared to an evaluation criterion of ± 10%. Four analytes were outside evaluation criteria. Table 1.3 summarizes the outlying serial dilutions and the resultant data qualifications. The serial dilution results for the December 2003 SFW/ GRW sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for groundwater samples. Recovery for internal standard Y was high for the ICPMS analysis of samples SUMP5000-T01N-GRW, LOWSPRING13-T01N-GRW and LOWERSPRING13-D01N-GRW. Therefore the beryllium and molybdenum results for all samples were reported from the trace ICP. Recovery for internal standard Li was high for sample LOWERSPRING13-D01N-GRW. Therefore, potassium results for all samples were reported from the trace ICP. The trace ICP beryllium, molybdenum and potassium reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The laboratory-generated cation/ anion balances were compared against an evaluation criterion of ± 13% to assess the usability of the data. All reported cation/anion balances met this criterion and therefore did not require qualification. The ratios of the calculated to measured TDS results were within 0.5 and 1.5 for all field samples.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any site-specific field quality control samples. The field quality control results for the December 2003 SFW/GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH
SUMP5000-T01N-GRW	1480 J	6.6 J
LOWERSPRING13-T01N-GRW	1660 J	4.3 J
COLUMCANYON-T01N-GRW	138 J	6.6 J
MMW-28A-T01N-GRW	659 J	6.2 J
CC1A-T01N-GRW	429 J	7.0 J
CC1B-T01N-GRW	535 J	7.3 J
CC2A-T01N-GRW	1210 J	6.4 J
CC2B-T01N-GRW	1410 J	7.0 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Boron DF=1	7.1	---	---	7.0	---	6.3	SUMP5000-D01N-GRW	U CCB-I
Chromium DF=1	---	---	1.5	---	---	1.1	CC1A-D01N-GRW CC1A-T01N-GRW CC2B-D01N-GRW CC2B-T01N-GRW	U CCB-I
Molybdenum DF=1	1.6	---	---	---	---	1.1	COLUMCANYON-D01N-GRW COLUMCANYON-T01N-GRW	U CCB-I
Potassium DF=1	535.9	---	---	915.1	---	318.0	COLUMCANYON-D01N-GRW COLUMCANYON-T01N-GRW LOWERSPRING13-D01N-GRW LOWERSPRING13-T01N-GRW SUMP5000-T01N-GRW	U CCB-I
Vanadium DF=1	---	---	---	---	0.436	0.20	SUMP5000-D01N-GRW CC1A-T01N-GRW	U MB-I

P=ICP MB = Method Blank CCB = Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
SUMP5000-T01N-GRW			
Cadmium	13.3%	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualified parent sample result as UJ DL-L
Cobalt	14.0%		Qualified parent sample result as UJ DL-L
Copper	11.2%		Qualified parent sample result as UJ DL-L
Nickel	15.9%		Qualified parent sample result as UJ DL-L

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT238S Sampling Event: December 2003 SFW/GRW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike Date Completed: 04/08/04

Peer Reviewer: Stacey Coker Date Completed: 04/13/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganics
RR-US-SPRING13-T01N-SFW	SA, MS, LD	554607	RRUS-SPRING13-T01N-SF RRUS-SPRING13-T01N-SFW	W	X	X
RR-US-SPRING13-D01N-SFW	SA, MS, LD	554608	RRUS-SPRING13-D01N-SF RRUS-SPRING13-D01N-SFW	W	X	
RR-DS-SPRING39-T01N-SFW	SA	554609	RRDS-SPRING39-T01N-SF RRDS-SPRING39-T01N-SFW	W	X	X
RR-DS-SPRING39-D01N-SFW	SA	554610	RRDS-SPRING39-D01N-SF RRDS-SPRING39-D01N-SFW	W	X	
RR-DS-SPRING13-T01N-SFW	SA	554611	RRDS-SPRING13-T01N-SF RRDS-SPRING13-T01N-SFW	W	X	X
RR-DS-SPRING13-D01N-SFW	SA	554612	RRDS-SPRING13-D01N-SF RRDS-SPRING13-D01N-SFW	W	X	
RR-DS-SPRING13-T01D-SFW	FD	554613	RRDS-SPRING13-T01D-SF RRDS-SPRING13-T01D-SFW	W	X	X
RR-DS-SPRING13-D01D-SFW	FD	554614	RRDS-SPRING13-D01D-SF RRDS-SPRING13-D01D-SFW	W	X	
RR-US-SPRING39-T01N-SFW	SA	554615	RRUS-SPRING39-T01N-SF RRUS-SPRING39-T01N-SFW	W	X	X
RR-US-SPRING39-D01N-SFW	SA	554616	RRUS-SPRING39-D01N-SF RRUS-SPRING39-D01N-SFW	W	X	
RB01T-SFW	RB	554891		W	X	X
RB01D-SFW	RB	554892		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate RB = Rinsate Blank MS = Matrix Spike LD = Laboratory Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

During the TDS analysis of samples RRUS-SPRING13-T01N-SFW and it's associated replicate, RRUS-SPRING39-T01N-SFW and RB01T-SFW exhibited weight differences between the duplicate final weight measurements that exceeded 0.0005 grams. This was discovered during the data review process and the samples were not reanalyzed, as the samples were well beyond the holding time. The TDS results for these samples were qualified as estimated (J D – I) to denote the slight imprecision in the measurements.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding times for pH and conductivity analyses were exceeded between 2 and 15 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Aluminum, antimony, boron, chromium, manganese, molybdenum, potassium and selenium were detected in various blanks. Qualifications of data were not necessary for chromium, manganese, molybdenum, potassium and boron since the sample concentrations were either nondetect or 4X the spike concentration. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS RRUS-SPRING13-T01N-SFW RRUS-SPRING13-D01N-SFW • LD RRUS-SPRING13-T01N-SFW RRUS-SPRING13-D01N-SFW	No	For sample RRUS-SPRING13-T01N-SFW all matrix spike recoveries were within evaluation criteria except for TKN. Table 1.3 summarizes the outlying matrix spike recovery and the resultant data qualification. The matrix quality control results for December 2003 SFW/ GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RRUS-SPRING13-T01N-SFWSL RRUS-SPRING13-D01N-SFWSL • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on the matrix spikes of samples RR-US-SPRING13-T01N-SFW AND RR-US-SPRING13-D01N-SFW. The results were applicable for 20 and 21 metals respectively. The percent difference between undiluted and diluted sample results was compared to an evaluation criterion of ± 10%. For sample RRUS-SPRING13-T01N-SFW, two analytes were outside evaluation criteria. Table 1.4 summarizes the outlying serial dilution results and the resultant data qualifications. The serial dilution results for the December 2003 SFW/ GRW sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for surface water samples. Recoveries for internal standard Sc were slightly high for the ICPMS analysis for all samples in this SDG. Therefore, aluminum, boron, chromium, vanadium and zinc results for all samples were reported from the trace ICP. The trace ICP aluminum, boron, chromium, vanadium and zinc reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. However, the laboratory did not reanalyze the samples for selenium on the trace ICP. Since the internal standard recoveries were only slightly high, selenium results for all samples in this SDG were qualified as estimated (**J/UJ IS-I**). The laboratory-generated cation/ anion balances were compared against an evaluation criterion of ± 13% to assess the usability of the data. All reported cation/ anion balances met this criterion and therefore did not require qualification except for RB01T-SFW. However, data qualification was not necessary because the contribution due to reporting limits for nondetect results controlled the calculation.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The ratios of the calculated to measured TDS results were within 0.5 and 1.5 for all field samples.
Field QC • Field Duplicate (FD) RRDS-SPRING13-T01N-SFW RRDS-SPRING13-T01D-SFW RRDS-SPRING13-D01N-SFW RRDS-SPRING13-D01D-SFW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	All field duplicate results were within evaluation criteria, therefore, no qualifications of data were necessary. The field quality control results for the December 2003 SFW/ GRW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. There were a few detections in the rinsate blank (RB) samples. Rinsate blank detections will be evaluated collectively and resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH
RRDS-SPRING13-T01N-SFW	422 J	7.1 J
RRDS-SPRING13-T01D-SFW	426 J	7.0 J
RB01T-SFW	0.000 J	7.0 J
RRUS-SPRING13-T01N-SFW	399 J	7.5 J
RRDS-SPRING39-T01N-SFW	395 J	7.1 J
RRUS-SPRING39-T01N-SFW	282 J	7.0 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum DF=1	40.4	---	35.6	35.4	---	---	---	22.1	RRUS-SPRING39-T01N-SFW RRUS-SPRING39-D01N-SFW RRDS-SPRING39-D01N-SFW RRUS-SPRING13-D01N-SFW	U CCB-I
Antimony DF=1	1.2	0.9	1.2	1.0	1.2	0.9	---	0.50	RRDS-SPRING39-T01N-SFW RRUS-SPRING13-D01N-SFW RRUS-SPRING13-T01N-SFW	U CCB-I
Selenium DF=1	0.3	---	---	---	---	---	---	0.30	RRUS-SPRING13-D01N-SFW RRUS-SPRING13-T01N-SFW	U CCB-I

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Recovery Not Meeting Criteria

Sample/Analytes	Matrix Spike Recoveries	Acceptance Limits	Action
RRUS-SPRING13-T01N-SFW			
TKN	71.0	75-125%	Qualified parent sample result as J MS-L

Table 1.4
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
RRUS-SPRING13-T01N-SFW			
Arsenic	12.8%	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualified parent sample result as UJ DL-L
Selenium	11.3%		Qualified parent sample result as UJ DL-L

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE JANUARY 2004 SURFACE WATER AND GROUNDWATER SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

April, 2004

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Holding Blanks 3-1
3.2.2 Manual Integration 3-1
3.2.3 Low-Level Detections 3-1
3.2.4 TICS Reported In Blanks 3-1
3.2.5 Dilution Schemes/Non-Detects With Elevated Rls 3-2
3.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 3-2
3.2.7 Non-Valid Matrix Spikes 3-2
3.2.8 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Assessment of Matrix Quality Control Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.1.1 Post-Digestion Spikes 4-7
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-7
4.3 ICP Serial Dilution Results 4-8

Section 5 Collective Assessment of Field Quality Control Results 5-1

5.1 Field Duplicate Agreement 5-1
5.2 Rinsate Blank Results 5-2
5.3 Field Blank Results 5-3
5.4 Trip Blank Results 5-5

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-2
6.3 Completeness 6-3
6.4 Representativeness 6-3
6.5 Comparability 6-3
6.6 Sensitivity 6-3

TABLE OF CONTENTS

List of Tables

Table 1-1 Summary of Groundwater Samples Collected January 2004
Table 1-2 Summary of Surface Water Samples Collected January 2004
Table 4-1 Field Samples Designated for Matrix QC Analysis
Table 4-2 Inorganics Matrix Spike Results
Table 4-3 Metals Matrix Spike Results
Table 4-4 Organics Matrix Spike Results
Table 4-5 ICP Serial Dilution Results
Table 4-6 ICP Serial Dilution Overall Assessment
Table 5-1 Summary of Field Duplicate Samples Collected January 2004
Table 5-2 Summary of Rinsate Blank Samples Collected January 2004
Table 5-3 Summary of Rinsate Blank Results and Additional Qualifications
Table 5-4 Summary of Field Blank Samples Collected January 2004
Table 6-1 Summary of Precision Assessment for January 2004
Table 6-2 Summary of Accuracy Assessment for January 2004

List of Attachments

Attachment 1.1 Data Review Summary for Data Package WAT239C
Attachment 1.2 Data Review Summary for Data Package WAT240C
Attachment 1.3 Data Review Summary for Data Package WAT241A
Attachment 1.4 Data Review Summary for Data Package WAT242C
Attachment 1.5 Data Review Summary for Data Package WAT243C
Attachment 1.6 Data Review Summary for Data Package WAT244S
Attachment 1.7 Data Review Summary for Data Package WAT245C
Attachment 1.8 Data Review Summary for Data Package WAT246C
Attachment 1.9 Data Review Summary for Data Package WAT247C
Attachment 1.10 Data Review Summary for Data Package WAT248C
Attachment 1.11 Data Review Summary for Data Package WAT249A
Attachment 1.12 Data Review Summary for Data Package WAT250C
Attachment 1.13 Data Review Summary for Data Package WAT251C
Attachment 1.14 Data Review Summary for Data Package WAT252A
Attachment 1.15 Data Review Summary for Data Package WAT253S
Attachment 1.16 Data Review Summary for Data Package WAT254S
Attachment 1.17 Data Review Summary for Data Package WAT255C
Attachment 1.18 Data Review Summary for Data Package WAT256A
Attachment 1.19 Data Review Summary for Data Package WAT257C
Attachment 1.20 Data Review Summary for Data Package WAT258A
Attachment 1.21 Data Review Summary for Data Package WAT259C
Attachment 1.22 Data Review Summary for Data Package WAT260A

This Data Validation Report (DVR) provides a general overview of the usability of the surface and ground water chemical analytical data obtained during the January 2004 sampling event at Molycorp Questa Mine in Questa, New Mexico. This report contains the results and process of the sample specific data reviews and collective evaluations for the water samples collected in support of the Remedial Investigation/Feasibility Study (RI/FS) during the month of January 2004.

January 2004 RI/FS water samples were submitted to Severn Trent Laboratories (STL) Burlington in Colchester, Vermont for chemical analysis. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods utilized were according to the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). Sample and QC results were reported in 22 original packages.

Tables 1-1 and 1-2 summarize the groundwater and surface water samples collected during this sampling event, along with the analyses performed on each sample and the accompanying QC samples.

Table 1-1
Summary of Groundwater Samples Collected January 2004

Sample Identification[1] (SDG)	Total Metals	Dissolved Metals	Inorganics	CLP VOCs	SW846 8260B VOCs	SW846 8270 SIM (PAHs Only)	Explosives	SW846 8015M (TPH)
003CENTRALSEEP-T01N-GRW (WAT246C)	X	X	X	---	---	---	---	---
003EASTSEEP-T01N-GRW (WAT246C)	X	X	X	---	---	---	---	---
003-WESTSEEP-T01N-GRW (WAT246C)	X	X	X	---	---	---	---	---
CAPULINSPRING-T01N-GRW (WAT241A)	X	X	X	---	---	---	---	---
CC1A-T01N-GRW (WAT242C)	X	X	X	---	---	--	---	---
CC1B-T01N-GRW (WAT242C)	X	X	X	---	---	---	---	---
CC2A-T01N-GRW (WAT242C)	X	X	X	---	---	---	---	---
CC2B-T01N-GRW (WAT242C)	X	X	X	---	---	---	---	---
CHAMBERSPRING-T01N-GRW (WAT245C)	X	X	X	---	---	---	---	---
COLUMBINE CANYON-T01N-GRW (255C)	X, MS/LD	X, MS/LD	X, MS/LD	---	---	---	---	---
COLUMBINE NO 1-T01N-GRW (WAT249A)	X	X	X	---	---	--	---	---
COLUMBINE NO 2-T01N-GRW (WAT249A)	X	X	X	---	---	---	---	---
COMPANYCABINSWELL-T01N-GRW(245C)	X	X	X	---	---	---	---	---
DOUGLAS WELL-T01N-GRW (WAT252A)	X	X	X	---	---	---	---	---
EMBARGOROADSEEP-T01N-GRW (247C)	X	X	X	---	---	---	---	---
EW-1-T01N-GRW (WAT247C)	X	X	X	---	---	---	---	---
EW-2-T01N-GRW (WAT247C)	X	X	X	---	---	--	---	---
EW-3-T01N-GRW (WAT246C)	X	X	X	---	---	---	---	---
EW-4-T01N-GRW (WAT250C)	X	X	X	---	---	---	---	---
EW-5A-T01N-GRW (WAT246C)	X, FD	X, FD	X, FD	---	---	---	---	---
EW-5B-T01N-GRW (WAT247C)	X	X	X	---	---	---	---	---
EW-5C-T01N-GRW (WAT247C)	X	X	X	---	---	---	---	---
EW-5D-T01N-GRW 9WAT247C)	X	X	X	---	---	--	---	---
EW-6-T01N-GRW (WAT247C)	X, MS/LD	X, MS/LD	X, MS/LD	---	---	---	---	---
FAGERQUISTWELL-T01N-GRW (WAT245C)	X, MS/LD	X, MS/LD	X, MS/LD	---	---	---	---	---
GOATHILLSPRING-T01N-GRW (WAT241A)	X, FD	X, FD	X, FD	---	---	---	---	---
GWW-1-T01N-GRW (WAT256A)	X	X	X	---	---	---	---	---
GWW-2-T01N-GRW (WAT256A)	X	X	X	---	---	---	---	---
GWW-3-T01N-GRW (WAT256A)	X, MS/LD	X, MS/LD	XD, MS/LD	---	---	--	---	---
LABWELL-T01N-GRW (WAT245C)	X, FD	X, FD	X, FD	---	---	---	---	---
LOWER SPRING 13-T01N-GRW (WAT256A)	X, RB	X, RB	X, RB	---	---	---	---	---
LS-1-T01N-GRW (WAT248C)	X	X	X	---	---	---	---	---
LS-2-T01N-GRW (WAT248C)	X	X	X	---	---	---	---	---
LS-3-T01N-GRW (WAT0248C)	X	X	X	---	---	---	---	---
MINE 1-T01N-GRW (WAT251C)	X	X	X	---	---	--	---	---
MMW-10A-T01N-GRW (WAT256A)	X	X	X	---	---	---	---	---
MMW-10B-T01N-GRW (WAT255C)	X	X	X	---	---	---	---	---

Table 1-1
Summary of Groundwater Samples Collected January 2004

Sample Identification[1] (SDG)	Total Metals	Dissolved Metals	Inorganics	CLP VOCs	SW846 8260B VOCs	SW846 8270 SIM (PAHs Only)	Explosives	SW846 8015M (TPH)
MMW-10C-T01N-GRW (WAT249A)	X	X	X	---	---	---	---	---
MMW-11A-T01N-GRW (WAT258A)	X, FD	X, FD	X, FD	---	---	---	---	---
MMW-11-T01N-GRW (WAT258A)	X, RB	X, RB	X, RB	---	---	---	---	---
MMW-13-T01N-GRW (WAT259C)	X	X	X	---	---	--	---	---
MMW-17A-T01N-GRW (WAT241A)	X	X	X	---	---	---	---	---
MMW-17B-T01N-GRW (WAT241A)	X	X	X	---	---	---	---	---
MMW-18B-T01N-GRW (WAT251C)	X	X	X	---	---	---	---	---
MMW-19A-T01N-GRW (WAT249A)	X	X	X	---	---	---	---	---
MMW-19B-T01N-GRW (WAT250C)	X	X	X	---	---	---	---	---
MMW-21-T01N-GRW (WAT252A)	X, FD	X, FD	X, FD	---	---	--	---	---
MMW-22-T01N-GRW (WAT252A)	X	X	X	---	---	---	---	---
MMW-24-T01N-GRW (WAT249A)	X	X	X	---	---	---	---	---
MMW-25B-T01N-GRW (WAT257C)	X	X	X	---	---	---	---	---
MMW-27A-T01N-GRW (WAT249A)	X, MS/LD	X, MS/LD	X, MS/LD	---	---	---	---	---
MMW-28A-T01N-GRW (WAT255C)	X	X	X	---	---	---	---	---
MMW-28B-T01N-GRW (WAT256A)	X	X	X	---	---	--	---	---
MMW-29A-T01N-GRW (WAT255C)	X	X	X	---	---	---	---	---
MMW-29B-T01N-GRW (WAT255C)	X	X	X	---	---	---	---	---
MMW-2-T01N-GRW (WAT249A)	X	X	X	---	---	---	---	---
MMW-30A-T01N-GRW (WAT252A)	X	X	X	---	---	---	---	---
MMW-30B-T01N-GRW (WAT251C)	X,RB	X,RB	X,RB	X,FD, MS/MSD	X,FB,RB	---	X,FD, MS/MSD, FB, RB	---
MMW-31A-T01N-GRW (WAT252A)	X	X	X	---	---	--	---	---
MMW-31B-T01N-GRW (WAT251C)	X	X	X	---	---	---	---	---
MMW-32A-T01N-GRW (WAT241A)	X	X	X	---	---	---	---	---
MMW-32B-T01N-GRW (WAT245C)	X	X	X	---	---	---	---	---
MMW-33A-T01N-GRW (WAT256A)	X	X	X	---	---	---	---	---
MMW-34B-T01N-GRW (WAT249A)	X	X	X	---	---	---	---	---
MMW-35B-T01N-GRW (WAT250C)	X	X	X	---	---	--	---	---
MMW-36B-T01N-GRW (WAT249A)	X	X	X	---	---	---	---	---
MMW-38A-T01N-GRW (WAT260A)	X	X	X	---	---	---	---	---
MMW-39A-T01N-GRW (WAT258A)	X	X	X	---	---	---	---	---
MMW-3-T01N-GRW (WAT245C)	X	X	X	---	---	---	---	---
MMW-40A-T01N-GRW (WAT257C)	X	X	X	---	---	---	---	---
MMW-42A-T01N-GRW (WAT258A)	X	X	X	---	---	--	---	---
MMW-42B-T01N-GRW (WAT259C)	X	X	X	---	---	---	---	---
MMW-43A-T01N-GRW (WAT251C)	X	X	X	---	---	---	---	---
MMW-44A-T01N-GRW (WAT249C)	X	X	X	---	---	---	---	---
MMW-44B-T01N-GRW (WAT249A)	X	X	X	---	---	---	---	---
MMW-45A-T01N-GRW (WAT250C)	X	X	X	---	---	---	---	---
MMW-45B-T01N-GRW (WAT249A)	X	X	X	---	---	--	---	---
MMW-47A-T01N-GRW (WAT241A)	X	X	X	---	---	---	---	---
MMW-48A-T01N-GRW (WAT258A)	X,FD, MS/LD, RB	X,FD, MS/LD,RB	X,FD, MS/LD,RB	X,FD, MS/MSD	X,FB, RB[2]	X,FD, MS/MSD, FB,RB[2]	---	X,FD, MS/MSD, FB, RB[2]
MMW-49A-T01N-GRW (WAT256A)	X	X	X	---	---	---	---	---
MMW-7-T01N-GRW (WAT252A)	X	X	X	---	---	---	---	---
MMW-8A-T01N-GRW (WAT245C)	X	X	X	---	---	---	---	---
MMW-8B-T01N-GRW (WAT245C)	X	X	X	---	---	--	---	---
MW-10-T01N-GRW (WAT242C)	X	X	X	---	---	---	---	---
MW-11-T01N-GRW (WAT242C)	X	X	X	---	---	---	---	---
MW-12-T01N-GRW (WAT243C)	X, FD	X, FD	X, FD	---	---	---	---	---
MW-13-T01N-GRW (WAT246C)	X	X	X	---	---	---	---	---
MW-14-T01N-GRW (WAT239C)	X, FD	X, FD	X, FD	---	---	---	---	---
MW-15-T01N-GRW (WAT240C)	X, RB	X, RB	X, RB	---	---	--	---	---
MW-17-T01N-GRW (WAT242C)	X	X	X	---	---	---	---	---
MW-1-T01N-GRW (WAT240C)	X, MS/LD	X, MS/LD	X, MS/LD	---	---	---	---	---
MW-20-T01N-GRW 9WAT247C)	X, FD	X, FD	X, FD	---	---	---	---	---
MW-21-T01N-GRW (WAT247C)	X	X	X	---	---	---	---	---
MW-22-T01N-GRW (WAT239C)	X	X	X	---	---	---	---	---
MW-23-T01N-GRW (WAT239C)	X	X	X	---	---	--	---	---
MW-24-T01N-GRW (WAT243C)	X, RB	X, RB	X, RB	---	---	---	---	---
MW-25-T01N-GRW (WAT240C)	X	X	X	---	---	---	---	---

Table 1-1
Summary of Groundwater Samples Collected January 2004

Sample Identification[1] (SDG)	Total Metals	Dissolved Metals	Inorganics	CLP VOCs	SW846 8260B VOCs	SW846 8270 SIM (PAHs Only)	Explosives	SW846 8015M (TPH)
MW-26-T01N-GRW (WAT239C)	X	X	X	---	---	---	---	---
MW-27-T01N-GRW (WAT240C)	X	X	X	---	---	---	---	---
MW-28-T01N-GRW (WAT240C)	X	X	X	---	---	---	---	---
MW-29-T01N-GRW (WAT240C)	X	X	X	---	---	--	---	---
MW-2-T01N-GRW (WAT246C)	X	X	X	---	---	---	---	---
MW-4-T01N-GRW (WAT240C)	X	X	X	---	---	---	---	---
MW-7A-T01N-GRW (WAT139C)	X	X	X	---	---	---	---	---
MW-7C-T01N-GRW (WAT243C)	X	X	X	---	---	---	---	---
MW-9A-T01N-GRW (WAT239C)	X, RB	X, RB	X, RB	---	---	---	---	---
MW-A-T01N-GRW (WAT242C)	X	X	X	---	---	--	---	---
MW-B-T01N-GRW (WAT242C)	X	X	X	---	---	---	---	---
MW-CH-T01N-GRW (WAT243C)	X	X	X	---	---	---	---	---
OUTFALL002-T01N-GRW (WAT244S)	X	X	X	---	---	---	---	---
OUTFALL2PIPE-T01N-GRW (WAT244S)	X	X	X	---	---	---	---	---
P-1-T01N-GRW (WAT252A)	X, RB	X, RB	X, RB	---	---	---	---	---
P-2-D01N-GRW (WAT256A)	X	X	X	---	---	--	---	---
P-2-T01N-GRW (WAT256A)	X	X	X	---	---	---	---	---
P-3-T01N-GRW (WAT252A)	X	X	X	---	---	---	---	---
P-4B-T01N-GRW (WAT256A)	X	X	X	---	---	---	---	---
P-5B-T01N-GRW (WAT252A)	X	X	X	---	---	---	---	---
P-5C-T01N-GRW (WAT252A)	X	X	X	---	---	---	---	---
PR-3-T01N-GRW (WAT251C)	X	X	X	---	---	--	---	---
RANGER STATION-T01N-GRW (WAT257C)	X	X	X	---	---	---	---	---
SC-1A-T01N-GRW (WAT260A)	X	X	X	---	---	---	---	---
SC-1B-T01N-GRW (WAT259C)	X	X	X	---	---	---	---	---
SC-2B-T01N-GRW (WAT259)	X	X	X	---	---	---	---	---
SC-3A-T01N-GRW (WAT260A)	X	X	X	---	---	---	---	---
SC-3B-T01N-GRW (WAT257C)	X	X	X	---	---	--	---	---
SC-4A-T01N-GRW (WAT258A)	X	X	X	---	---	---	---	---
SC-5A-T01N-GRW (WAT260A)	X	X	X	---	---	---	---	---
SC-5B-T01N-GRW (WAT259C)	X	X	X	---	---	---	---	---
SC-6A-T01N-GRW (WAT258A)	X	X	X	---	---	---	---	---
SC-7A-T01N-GRW (WAT260A)	X	X	X	---	---	---	---	---
SC-8A-T01N-GRW (WAT259C)	X	X	X	---	---	--	---	---
SPRING 13 PUMP-T01N-GRW (WAT256A)	X	X	X	---	---	---	---	---
SPRING 13-T01N-GRW (WAT256A)	X	X	X	---	---	---	---	---
SPRING 39 PUMP-T01N-GRW (WAT256A)	X	X	X	---	---	---	---	---
SPRING10-T01N-GRW (WAT243C)	X	X	X	---	---	---	---	---
SPRING12A-T01N-GRW (WAT245C)	X	X	X	---	---	---	---	---
SPRING12-T01N-GRW (WAT245C)	X	X	X	---	---	--	---	---
SPRING-14MA-T01N-GRW (WAT241A)	X	X	X	---	---	---	---	---
SPRING14M-T01N-GRW (WAT241A)	X	X	X	---	---	---	---	---
SPRING14T-T01N-GRW (WAT248C)	X	X	X	---	---	---	---	---
SPRING15T-T01N-GRW (WAT248C)	X	X	X	---	---	---	---	---
SPRING17-T01N-GRW (WAT248C)	X, MS/LD	X, MS/LD	X, MS/LD	---	---	---	---	---
SPRING18-T01N-GRW (WAT248C)	X	X	X	---	---	---	---	---
SPRING9A-T01N-GRW (WAT243C)	X	X	X	---	---	--	---	---
SPRING9-T01N-GRW (WAT243C)	X	X	X	---	---	---	---	---
SUMP5000-T01N-GRW (WAT255C)	X	X	X	---	---	---	---	---
US-1-T01N-GRW (WAT246C)	X, MS/LD	X, MS/LD	X, MS/LD	---	---	---	---	---
US-2-T01N-GRW (WAT239C)	X	X	X	---	---	---	---	---
US-3-T01N-GRW (WAT242C)	X	X	X	---	---	---	---	---
WALDOSPRING-T01N-GRW (WAT241A)	X	X	X	---	---	--	---	---
WESTSEEP-T01N-GRW (WAT246C)	X	X	X	---	---	---	---	---
Number GW samples	150	150	150		2	1	1	1
Number MS/MSD or MS/LD	9	9	9		2	1	1	1
Number Field Duplicates	9	9	9		2	1	1	1
Number Rinsate Blanks	9	9	9		2	1	1	1
Number Field Blanks	N/A	N/A	N/A		2	1	1	1

N/A = Not Applicable MS = Matrix Spike LD = Laboratory Duplicate MSD = Matrix Spike Duplicate FD = Field Duplicate RB = Rinsate Blank

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

[2]These additional organic analyses were collected for a non-RI/FS purpose; as such, the methods utilized are not covered by the QAPP.

Table 1-2
Summary of Surface Water Samples Collected January 2004

Sample Identification[1] (SDG)	Total Metals	Dissolved Metals	Inorganics	BOD/COD
RR-10A1-T01N-SFW (WAT253S)	X	X	X	X
RR-10-T01N-SFW (WAT253S)	X	X	X	X
RR-11A1-T01N-SFW (WAT253S)	X	X	X	X
RR-11C-T01N-SFW (WAT253S)	X	X	X	X
RR-12-T01N-SFW (WAT253S)	X	X	X	X
RR-13-T01N-SFW (WAT254S)	X	X	X	X
RR-14-T01N-SFW (WAT253S)	X	X	X	X
RR-16-T01N-SFW (WAT253S)	X	X	X	X
RR-7-T01N-SFW (WAT254S)	X	X	X	X
RR-DS-SPRING 13-T01N-SFW (254S)	X, FD	X, FD	X, FD	X, FD
RR-DS-SPRING 39-T01N-SFW (254S)	X	X	X	X
RR-US-SPRING 13-T01N-SFW (253S)	X, MS/LD	X, MS/LD	X, MS/LD	X, MS/LD
RR-US-SPRING 39-T01N-SFW (254S)	X, RB	X, RB	X, RB	X, RB
Number SFW samples	13	13	13	13
Number MS/MSD or MS/LD	1	1	1	1
Number Field Duplicates	1	1	1	1
Number Rinsate Blanks	1	1	1	1

MS = Matrix Spike LD = Laboratory Duplicate FD = Field Duplicate

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

The data review process evaluated sample-specific and laboratory performance criteria in accordance with the standard operating procedure (SOP) 12.1. As mentioned in the SOP, all RI/FS data generated for the Questa Mine received an evaluation of sample-specific parameters. In addition, 10% of the data packages (per analysis type per event) were reviewed for laboratory performance parameters. The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Sample-specific reviews evaluated the following sample related parameters:

- Case narrative comments
- Chain-of-Custody/Sample Receipt
- Holding Times
- Method Blank (Preparation Blank)
- Matrix-Dependent Quality Control
  - Matrix Spike Analysis
  - Laboratory duplicate Analysis
- Method-Specific Quality Control Measures
  - Inorganic Method Specific QC Measures
    - Post Digestion Spike Analysis
    - ICP Serial Dilution Tests
    - Internal Standard Performance
    - Cation/Anion Balance Evaluation
  - Organic Method Specific QC Measures
    - Surrogate Spike Compound Recovery
    - Internal Standards
- Total versus Partial Balance
- Field quality control samples
  - Field Duplicate Agreement
  - Rinsate Blank Results
  - Field Blank Results
  - Trip Blank Results

Evaluation of laboratory performance parameters provided an overall representation of the analytical system at the time the samples were analyzed. The laboratory performance review evaluated parameters in control of the laboratory, but independent of the field samples analyzed, as follows:

- Initial Calibration
- Continuing Calibration Verification
- Laboratory Control Sample Analysis

- Compound Identification
- Target Analyte Quantification
- Verification
- Method-Specific Quality Control Checks

If any potential systematic problems were determined upon review of the laboratory performance parameters in any of the selected packages evaluated (meeting the 10% criteria), the review parameter was evaluated in all data packages for January 2004 to determine the need for data qualification. Instances, in which professional judgement was exercised in evaluating the need for data qualification, the basis for this rationale was provided in the data review summary.

Upon completion of the sample-specific reviews and laboratory performance reviews, a collective assessment for the event was performed. Site-specific matrix spike, laboratory duplicate, serial dilution, blank (field and rinsate), and field duplicate results were assessed collectively by matrix per event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered more representative of the site sample matrix and a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 3.0 describes sample-specific data review findings and several data quality issues affecting all of the water packages. Section 4.0 presents the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Section 5.0 summarizes the collective summary of the field QC results (field and rinsate blanks, when applicable, and field duplicate results) and the resultant sample qualification. Lastly, an overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data validation narratives for each of the 22 data packages. In order to attain the frequency requirements for laboratory performance required for review, three packages required review of laboratory performance parameters. However, a total of four data packages (WAT251C, WAT253S, WAT257C, and WAT259C) were evaluated for laboratory performance criteria, as one of the packages (WAT259C) was evaluated for only the additional organic parameters of SVOCs and TPH (i.e., DRO). Results of the laboratory performance reviews are summarized in the individual data review summary reports. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were identified which globally affected all relevant groundwater and surface water samples analyzed for the January 2004 Groundwater and Surface Water Sampling Event. Although most of the issues have been addressed in the individual summary reports, these common issues and conclusions are summarized below:

3.2.1 Holding Blanks

For the analysis of the volatile organic samples, a holding blank was carried through the sample storage period and analyzed in the same sequence as the samples in the data package. As all holding blank recoveries were all nondetect, the indication of the occurrence of potential cross-contamination during sample storage was unlikely.

3.2.2 Manual Integration

Manual integration was employed in deriving results for the volatile and semivolatile organics in a few data packages. The values that were derived from manual integration were qualified on the quantitation reports and extracted ion current profiles were included for each instance. The supporting documentation provided was reviewed and found to be adequate.

3.2.3 Low-level Detections

Detected organic analytes with concentrations between the Method Detection Limit (MDL) and the Reporting Limit (RL) were qualified as estimated (J). A qualifier code of “SQL-I” (Sample Quantitation Limit) was assigned to reflect the greater uncertainty in quantitative values below the RL.

3.2.4 TICS Reported in Blanks

Several Tentatively Identified Compounds (TICs) were reported as present in the semivolatile blanks for each package in which semivolatile data were analyzed. TICs in method blanks are denote considered to be reportable as TICs for samples and such identifications were rejected,

flagged as unusable (R). The multiple unknown compounds not detected in the method blank were qualified as (NJ) to indicate that the analyses indicated the presence of an analyte that had been "tentatively identified" and the associated numerical value represented its approximate value.

3.2.5 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

3.2.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgement, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilbria were found to affect the matrix spike recoveries more than the expected accuracy of the analyses. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assess for accuracy of the analysis.

3.2.7 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked analytes. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.8 Laboratory Performance Review (LPR) Findings

As mentioned previously, laboratory performance parameters were reviewed for four data packages to assess the performance of the laboratory for all analyses. Any parameter evaluation resulting in data qualification was examined in all other January 2004 groundwater and surface

water packages to determine if data qualification was necessary. The parameters evaluated for all packages as applicable, include the following:

- Volatile Organic Compounds: continuing calibration check standard and laboratory control sample results
- Explosives: laboratory control sample results
- Inorganics: continuing calibration verification check standards
- Metals: Interference Check Standard

Inorganic matrix QC samples consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) samples. Organic matrix QC samples consisted of matrix spike/matrix spike duplicate (MS/MSD) samples. The site-specific matrix QC results were assessed collectively for the January 2004 Groundwater and Surface Water Sampling Event by matrix (groundwater and surface water, and total and dissolved fractions) to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.3 present the collective matrix QC results associated with the samples in this event and the resultant data qualifiers.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent quality control (QC) samples were used to evaluate how the sample matrix affected the accuracy and precision of the analytical results. Nine groundwater field samples were designated for both total/dissolved metals, and inorganics matrix spike analyses. Two groundwater field samples were designated for volatile organics matrix spike analyses. Sample MMW-30B was used for the MS/MSD for the CLP VOC method whereas sample MMW-48A was used for the MS/MSD for the 8260B VOC method. One groundwater field sample was designated for MS/MSD use for each of the remaining organic parameters (SVOC, Explosives, and TPH). One surface water field sample was designated for total/dissolved metals, inorganics, and BOD_5/COD matrix spike analyses, as summarized in Table 4-1. The QAPP frequency requirements of 5% was met for each of the analyses per groundwater and surface water for the January 2004 Groundwater and Surface Water Sampling Event.

Table 4-1
Field Samples Designated for Matrix QC Analysis

	Total Metals	Dissolved Metals	Inorganics	CLP VOCs	8260B VOCs	8270 SIM for PAHs	Explosives	8015M for TPH
GROUNDWATER								
COLUMBINE CANYON-T01N-GRW (WAT255C)	X	X	X	---	---	---	---	---
EW-6-T01N-GRW (WAT247C)	X	X	X	---	---	---	---	---
FAGERQUISTWELL-T01N-GRW (WAT245C)	X	X	X	---	---	---	---	---
GWW-3-T01N-GRW (WAT256Aas)	X	X	X	---	---	---	---	---
MMW-27A-T01N-GRW (WAT249A)	X	X	X	---	---	---	---	---
MMW-30B-T01N-GRW (WAT251C)	---	---	---	X	---	---	X	---
MMW-48A-T01N-GRW (WAT258A)	X	X	X	---	X[1]	X[1]		X[1]
MW-1-T01N-GRW (WAT240C)	X	X	X	---	---	---	---	---
SPRING17-T01N-GRW (WAT248C)	X	X	X	---	---	---	---	---
US-1-T01N-GRW (WAT246C)	X	X	X	---	---	---	---	---
Frequency:	6.0%	6.0%	6.0%	---	100%	100%	100%	100%
SURFACE WATER								
RR-US-SPRING13-T01N-SFW (WAT254S)	X	X	X	---	---	---	---	---
Frequency:	7.7%	7.7%	7.7%	N/A	N/A	N/A	N/A	N/A

[1] These organic analyses were conducted for a non-RI/FS purpose.

Several matrix spike recoveries were outside of the acceptance limits of 75-125% for both inorganics and metals. Tables 4-2, 4-3, and 4-4 summarize the results for each analyte, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix may have been qualified.

However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

Table 4-2
Inorganics Matrix Spike Results

Analyte	Number of Valid Spikes/ Total Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Additional Action
INORGANICS GROUNDWATER					
Chloride	8	0	0	104	No Qualification
Nitrate	9	0	1	160.75*	Parent sample qualified J MS-H
Fluoride	8	0	0	99.9	No Qualification
Ammonia	9	3	0	72.6	J/UJ MS-L all sample results
TKN	9	0	0	97.5	No Qualification
Nitrite	9	0	0	95.2	No Qualification
Ortho-phosphate	9	1	0	87.7	Parent sample qualified UJ MS-L
Phosphorus	9	1	0	89.5**	Parent sample qualified R MS-L
Sulfate	9	0	0	92.4	No Qualification
TOC	9	2	0	95.6	Both parent samples qualified UJ MS-L
INORGANICS SURFACE WATER					
Chloride	1	0	0	98.8	No Qualification
Nitrate	1	0	0	99.2	No Qualification
Fluoride	1	0	0	101.6	No Qualification
Ammonia	1	0	0	78.8	No Qualification
TKN	1	0	0	100.0	No Qualification
Nitrite	1	0	0	100.0	No Qualification
Ortho-phosphate	1	0	0	84.5	No Qualification
Phosphorus	1	0	0	103.2	No Qualification
Sulfate	1	0	0	78.0	No Qualification
TOC	1	0	0	98.0	No Qualification
BOD_5	1	0	0	99.5	No Qualification
COD	1	0	0	106.2	No Qualification

*Eight of the nitrate matrix spike results were within the acceptance range, the recovery of 573.3% for sample GWW-3-T01N-GRW (256A) biased the average matrix spike recovery high.

**The matrix spike recovery for sample MMW-27A-T01N-GRW was 3.6%.

Groundwater Summary for Inorganics

Nitrate, ortho-phosphate, phosphorus, and TOC were qualified on the basis of MS recoveries in only the affected parent groundwater samples. Due to the low frequency (1/9 or 2/9) of the MS recoveries reported outside the acceptance range and the fact that all average MS percent recoveries fell well within the established range (with the exception of nitrate), extending qualification of results to the remainder of the data set for these analytes was not considered necessary. In the case of nitrate, the average percent recovery was biased high due to a single point considered to be an outlier. As three of the nine ammonia matrix spike results were recovered outside of the acceptance range, with an average percent recovery of 72.6%, slightly below the lower limit of the acceptance range, all ammonia results for groundwater samples were qualified as estimated with a low bias code assigned.

Surface Water Summary for Inorganics

All analytes were recovered within the 75-125% acceptance range for the one surface water matrix spike sample. Therefore, no qualification of surface water samples was necessary on the basis of MS recoveries.

The accuracy of the analyses relative to the site specific matrix for both groundwaters and surface waters was considered acceptable for inorganic parameters.

Table 4-3
Metals Matrix Spike Results

Analyte	Total				Dissolved				Additional Action
	# Valid	%R <75%	%R > 125%	Avg %R	# Valid	%R <75%	%R > 125%	Avg %R	
METALS GROUNDWATER									
Aluminum	7	0	0	102.8	6	0	0	101.5	No Qualification
Antimony	9	0	0	106.5	9	0	0	104.9	
Arsenic	9	0	0	103.6	9	0	0	103.4	
Barium	9	0	0	99.5	9	0	0	98.3	
Beryllium	9	0	0	100.7	9	0	0	99.8	
Boron	9	0	0	102.5	9	0	0	100.0	
Cadmium	9	**1**	**2**	114.9	9	**2**	0	91.7	Dissolved parent samples J/UJ MS-L; J/UJ MS-I all total fraction samples* GWW-3-T01N-GRW R MS-L (19% R)
Chromium	8	0	0	104.7	8	0	0	100.5	No Qualification
Cobalt	9	0	**3**	111.7	9	0	**2**	107.8	J MS-H to all detected samples No Qualification to nondetect results
Copper	9	0	**2**	108.3	9	**1**	**1**	98.9	J MS-H to detected parent samples No Qualification to nondetect results J/UJ MS-L to one dissolved parent
Iron	6	0	0	109.3	6	0	0	103.8	No Qualification
Lead	9	0	0	104.5	9	0	0	106.9	
Manganese	6	0	0	101.9	7	0	0	102.7	
Mercury	9	0	0	101.1	9	0	0	100.3	
Molybdenum	9	0	0	100.7	9	0	0	99.5	
Selenium	9	**1**	0	101.8	9	0	0	104.2	J/UJ MS-L to parent sample only
Nickel	9	0	**1**	109.1	8	**1**	0	89.6	No Qualification (Nondetect results with high bias)
Thallium	9	0	0	105.5	9	0	0	103.3	No Qualification
Silver	9	0	0	103.5	9	0	0	103.6	
Vanadium	9	0	0	102.6	9	0	0	101.9	
Zinc	9	0	0	108.7	7	0	0	104.7	
Cyanide	8	**2**	0	83.8	NA	NA	NA	NA	J/UJ MS-L to all total fraction results GWW-3-T01N-GRW R MS-L (18.3%R)

Table 4-3
Metals Matrix Spike Results

Analyte	Total				Dissolved				Additional Action
	# Valid	%R <75%	%R > 125%	Avg %R	# Valid	%R <75%	%R > 125%	Avg %R	
METALS SURFACE WATER									
Aluminum	1	0	0	101.3	1	0	0	109.3	No Qualification
Antimony	1	0	0	105.3	1	0	0	105.7	
Arsenic	1	0	0	105.1	1	0	0	102.5	
Barium	1	0	0	98.7	1	0	0	107.1	
Beryllium	1	0	0	103.5	1	0	0	111.7	
Boron	1	0	0	100.8	1	0	0	108.2	
Cadmium	1	0	0	102	1	0	0	100.2	
Chromium	1	0	0	102.6	1	0	0	111.0	
Cobalt	1	0	0	101.1	1	0	0	109.3	
Copper	1	0	0	102.8	1	0	0	94	
Iron	1	0	0	106.3	1	0	0	100.8	
Lead	1	0	0	105.3	1	0	0	104.7	
Manganese	1	0	0	100.5	1	0	0	110.0	
Mercury	1	0	0	103.0	1	0	0	105.0	
Molybdenum	1	0	0	101.4	1	0	0	103.2	
Selenium	1	0	0	93.9	1	0	0	97.7	
Nickel	1	0	0	102.8	1	0	0	111.2	
Thallium	1	0	0	106.3	1	0	0	105.6	
Silver	1	0	0	105.6	1	0	0	102.3	
Vanadium	1	0	0	97.9	1	0	0	98.1	
Zinc	1	0	0	102.4	1	0	0	112.2	
Cyanide	1	0	0	88.6	NA	NA	NA	NA	

*Qualification was not extended to two samples for cadmium, as these matrix spike recoveries were high and the cadmium results were nondetect.

Groundwater Summary for Metals

Qualification was generally limited to only the parent samples for the majority of the analytes with matrix spikes outside of the acceptance range. However, qualification was extended to all cadmium, cobalt, and cyanide total results for groundwater samples. This assessment was based on the frequency of the matrix spike recoveries reported outside of the acceptance range (2/8 or 3/9), and the magnitudes of these recoveries, despite the fact that the average percent MS recoveries for all three analytes were within the acceptance range.

Surface Water Summary for Metals

The one matrix spike surface water sample reported MS recoveries for all analytes within the acceptance range of 75-125%. Therefore, no qualification of surface water samples was necessary on the basis of MS recoveries.

The accuracy of the metal analyses relative to the site-specific matrix for both groundwaters and surface waters was considered acceptable.

Table 4-4
Organics Matrix Spike Results

Analyte	Fraction	Historical Laboratory Recovery	Average % Recovery	Action
2-chloroethyl vinyl ether	VOC[1]	60-140%	0	R MS-L parent/field duplicate
Xylene (total)	VOC[1]	60-140%	73	UJ MS-L parent/field duplicate[2]
Xylene (m,p)	VOC[1]	78-116%	70	UJ MS-L parent/field duplicate
Xylene (o)	VOC[1]	81-125%	74	UJ MS-L parent/field duplicate
Styrene	VOC[1]	80-124%	36	UJ MS-L parent/field duplicate
Bromoform	VOC[1]	82-120%	76	UJ MS-L parent/field duplicate
1,1,2,2-tetrachloroethane	VOC[1]	74-108%	110	No Qualification
1,3,5-trimethylbenzen	VOC[1]	72-112%	55	UJ MS-L parent/field duplicate
1,2,4-trimethylbenzene	VOC[1]	75-123%	70	UJ MS-L parent/field duplicate
Chloroprene	VOC[1]	60-140%	39	UJ MS-L parent/field duplicate
Chloroethane	VOC[1]	65-113%	115	No Qualification
1,1-Dichloroethene	VOC[1]	61-145%	96	No Qualification
Benzene	VOC[1]	76-127%	98	No Qualification
Trichloroethene	VOC[1]	70-109%	103	No Qualification
Toluene	VOC[1]	76-125%	95	No Qualification
Chlorobenzene	VOC[1]	75-130%	97	No Qualification
Fluoranthene	SVOC	60-140%	134	No Qualification
Benzo (b) fluoranthene	SVOC	60-140%	134	No Qualification
Benzo (a) pyrene	SVOC	60-140%	134	No Qualification
Dibenz (a,h) anthracene	SVOC	60-140%	151	No Qualification due to nondetect result, with a high bias
HMX	EXP	83-122%	77.5	UJ MS-L parent/field duplicate
RDX	EXP	81-116%	71.5	J MS-L parent/field duplicate
2,4,6-Trinitrotoluene	EXP	75-106%	110	No Qualification due to nondetect result, with a high bias

Table 4-4
Organics Matrix Spike Results

Analyte	Fraction	Historical Laboratory Recovery	Average % Recovery	Action
PETN	EXP	75-110%	156	No Qualification due to nondetect result, with a high bias
PYX	EXP	70-130%	0	R MS-L parent/field duplicate
Diesel	TPH	60-140%	92	No Qualification

Note: Not all of the organic compounds spiked are listed. All matrix spike recoveries for those analytes not listed in this table were within the prescribed recovery range.

[1] For sample MMW-30B analyzed by the CLP methodology, a subset of analytes were spiked. For sample MMW-48A analyzed by Method 8260B, all 84 target analytes were spiked.

[2]Qualification was issued because qualification was necessary for all of the xylene isomers.

As a result of the matrix spike recoveries for VOC, a total of nine analytes were qualified as estimated in the parent sample (MMW-48A-T01N-GRW) and its duplicate sample (MMW-48A-T01D-GRW). The results for 2-chloroethyl vinyl ether in both of the aforementioned samples were rejected on the basis of a matrix spike recovery below 10%, as neither MS or MSD analysis recovered any of the analyte. The matrix spike recoveries for the remaining VOC analytes were all reported within the acceptance range.

The matrix spike recoveries for the SVOCs did not result in any qualification of results. As noted in the table, the average between the MS and MSD for three of the four analytes resulted in a recovery that fell within the historically-determined, analytical recovery range.

All explosive matrix spike results were recovered outside the prescribed acceptance range, resulting in qualification of the parent results as summarized in Table 4-4. Two explosive analytes did not require qualification for the potentially high bias because sample results were nondetect. The PYX results for the parent sample (MMW-30B-T01N-GRW) and its duplicate (MMW-30B-T01D-GRW) were rejected as none of the matrix spike was recovered in either the MS or MSD sample.

4.1.1 Post-Digestion Spikes

Post-digestion spikes were conducted on all ICP and ICP/MS analytes to determine whether matrix recoveries outside of the acceptance range were the result of sample matrix, or due to a bias in the analytical system. All post digestion recoveries for those analytes recovered outside of the acceptance range were reviewed and recovered within the range of 75-125%. Therefore, no qualification of data was assigned for any of the metal analytes on the basis of post-digestion spike recovery, as it was likely that all matrix spike exceedances were due to a matrix effect on digestion rather than a bias in the analytical system.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Laboratory duplicate sample results were evaluated to assess the precision of the laboratory analyses. Nine groundwater samples and one surface water sample were designated for metals, dissolved metals, and inorganic parameters laboratory duplicate analysis. None of the organic samples required laboratory duplicate analyses, as MSD samples were analyzed to assess precision. The evaluation criteria used are summarized in SOP 12.1. For metals, the Contract

Laboratory (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

As all samples designated for matrix spike analyses (MS) were also designated for either a matrix spike duplicate (MSD) or laboratory duplicate (LD) analysis, the sample frequency for the analyses of laboratory duplicates were the same as summarized in Table 4-1.

The RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were all within the QAPP acceptance limits. Therefore, no qualification of data was necessary on the basis of laboratory duplicate results at the sample-specific level. The overall level of precision demonstrated is considered to be acceptable.

4.3 ICP SERIAL DILUTION RESULTS

ICP serial dilutions were performed on metal samples in every data package. These analyses were run on the same samples as were designated for matrix QC analyses, or otherwise selected in data packages in which there were no QC samples. These analyses were used to evaluate whether or not significant physical or chemical interferences existed due to sample matrix. This was accomplished by analyzing the sample and a five-fold dilution of the sample. The percent difference (%D) between these two concentrations was compared to an acceptance criterion of $\leq$10%, only for those analytes for which the serial dilution analysis was applicable. Analytes were applicable if the initial concentrations were sufficiently higher (50x) than the IDL, accounting for dilution. Generally, the diluted result is considered more accurate as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result. The following table summarizes each sample utilized for a serial dilution analysis, along with the associated applicable analytes, and the analytes for which qualification in the parent sample was necessary (in bold).

Qualifications were generally limited to the parent samples if less than a quarter of the valid serial dilution results were outside of the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set, the average %D, and the magnitude of outages were also taken into consideration. Evaluation of the serial dilution results collectively did not result in any additional qualification of results. The analysis was considered to be in control and did not indicate a pervasive matrix analytical problem. Table 4-5 summarizes the average %Ds for each of the analytes broken down into total and dissolved fractions, along with the percent of applicable analytes that exceeded control criteria (10%).

Table 4-5
ICP Serial Dilution Results

Sample ID	Applicable Analytes (%D>10% in bold)
GROUNDWATER –DISSOLVED FRACTION	
MW-1-D01N-GRW (WAT240C)	Sb, As, Ba, Be, B, Cd, Ca, Co, Cu, Pb, Mn, Mo, Ni, Tl, Ag, V
FAGERQUISTWELL-D01N-GRW (WAT245C)	Sb, As, Ba, Be, B, Cd, Co, Cu, Pb, Mn, Mo, Ni, Tl, Ag, V
US-1-D01N-GRW (WAT246C)	Sb, As, Ba, Be, B, Cd, Co, Cu, Pb, Mn, Mo, Ni, Tl, Ag, V
EW-6-D01N-GRW (WAT247C)	Sb, As, Ba, Be, B, Cd, Ca, Co, Cu, Pb, Mn, Mo, Ni, Tl, Ag, V
SPRING17-D01N-GRW (WAT248C)	All analytes with the exception of: Mg, K, and Na
MMW-27A-D01N-GRW (WAT249A)	Ba, Mn
COLUMBINE ANYON-DO1N-GRW (WAT255C)	Sb, As, Ba, Be, B, Cd, Co, Cu, Pb,, Mo, Ni, Tl, Ag, V
GWW-3-D01N-GRW (WAT256A)	---
MMW-48A-D01N-GRW (WAT258A)	Mn
GROUNDWATER –TOTAL FRACTION	
US-2-T01N-GRW (WAT239C)	---
MW-1-T01N-GRW (WAT240C)	Sb, **As (13.5%),** Ba, Be, B, Cd, **Ca (10.5%),** Cr, Co, Cu, Pb, Mn, Mo, Ni, Tl, Ag, V
CAPULINSPRING-T01N-GRW (WAT241A)	Al, **Be (41.3%),** Fe, Mn, **Se (16%), Zn (10.8%)**
US-3-T01N-GRW (WAT242C)	Ca
SPRING9-T01N-GRW (WAT243C)	Ca
OUTFALL2PIPE-T01N-GRW (WAT244S)	Ca, Mg, Mn, Mo, Na
FAGERQUISTWELL-T01N-GRW (WAT245C)	Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mn, Ni, Tl, Ag, V
US-1-T01N-GRW (WAT246C)	Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Tl, Ag, V
EW-6-T01N-GRW (WAT247C)	Sb, As, Ba, Be, B, Ca, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Tl, Ag, V
SPRING17-T01N-GRW (WAT248C)	All analytes with the exception of Mg, K, and Na, Serial Dilution result for **Se: (17.3%)**
MMW-27A-T01N-GRW (WAT249A)	Ba, Mn
MMW-35B-T01N-GRW (WAT250C)	Ca, Mg, Mn, Na, Zn
PR-3-T01N-GRW (WAT251C)	---
MMW-21-T01D-GRW (WAT252A)	**Mn (16.5%)**
MMW-31A-T01N-GRW (WAT252A)	---
COLUMBINE CANYON-T01N-GRW (WAT255C)	Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Pb
GWW-3-T01N-GRW (WAT256A)	---
MMW-25B-T01N-GRW (WAT257C)	Ca
MMW-48A-T01N-GRW (WAT258A)	Mn
SC-8A-T01N-GRW (WAT259C)	---
SC-7A-T01N-GRW (WAT260A)	---
SURFACE WATER-DISSOLVED FRACTION	
RR-US-SPRING13-D01N-SFW (WAT253S)	All analytes with the exception of Fe, Mg, K, and Na Serial Dilution result for **Se: (14.6%)**
SURFACE WATER-TOTAL FRACTION	
RR-US-SPRING13-T01N-SFW (WAT253S)	All analytes with the exception of Mg, K, and Na Serial Dilution result for **Se (21.7%)**
RR-US-SPRING39-T01N-SFW (WAT254S)	Ca

---Indicates the serial dilution was not applicable to any of the metal analytes.

Table 4-6 summarizes the average %D for each analyte, the number of serial dilution results that were considered valid and in excess of 10%, and the resultant qualifiers based on the collective assessment.

Table 4-6
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	Avg. %D	#Ds >10%	# of Valid Results	% Valid Result >10%	Avg. %D	#Ds >10%	# of Valid Results	% Valid Result >10%	
GROUNDWATER									
Aluminum	5.2	0	2	---	4.5	0	1	---	None
Antimony	3.0	0	6	---	1.4	0	6	---	None
Arsenic	4.2	**1**	6	16.7%	3.6	0	6	---	Total fraction parent sample qualified UJ DL-L
Barium	1.4	0	7	---	2.1	0	7	---	None
Beryllium	8.9	**1**	7	14.3%	2.5	0	6	---	Total fraction parent sample qualified J DL-L
Boron	2.2	0	6	---	3.0	0	6	---	None
Cadmium	3.8	**1**	6	16.7%	4.9	0	6	---	Total fraction parent sample qualified J DL-H
Calcium	2.9	0	7	---	3.6	0	3	---	None
Chromium	1.7	0	6	---	3.7	0	6	---	None
Cobalt	2.7	0	6	---	3.9	0	6	---	None
Copper	1.9	0	6	---	3.9	0	6	---	None
Iron	6.3	0	2	---	9.2	0	1	---	None
Lead	2.0	0	6	---	2.5	0	6	---	None
Magnesium	2.3	0	1	---	N/A	0	0	---	None
Manganese	4.7	**1**	11	9.1%	3.6	0	7	---	Total fraction parent sample qualified UJ DL-L
Molybdenum	2.3	0	6	---	3.5	0	6	---	None
Nickel	3.6	0	6	---	4.1	0	6	---	None
Potassium	N/A	0	0	---	N/A	0	0	---	None
Selenium	16.7	**2**	2	100%	2.5	0	1	---	All total fraction samples qualified J/UJ DL-L
Silver	1.2	0	6	---	3.0	0	6	---	None
Sodium	8.6	0	1	---	N/A	0	0	---	None
Thallium	1.9	0	6	---	1.7	0	6	---	None
Vanadium	2.2	0	6	---	3.4	0	6	---	None
Zinc	3.7	0	3	---	2.0	0	1	---	None
SURFACE WATER									
Aluminum	1.2	0	1	---	8.9	0	1	---	None
Antimony	1.6	0	1	---	1.1	0	1	---	None
Arsenic	4.9	0	1	---	3.6	0	1	---	None
Barium	1.5	0	1	---	7.6	0	1	---	None
Beryllium	1.9	0	1	---	5.9	0	1	---	None
Boron	1.6	0	1	---	7.0	0	1	---	None
Cadmium	3.6	0	1	---	0.0	0	1	---	None
Calcium	1.5	0	3	---	7.2	0	1	---	None
Chromium	0.4	0	1	---	7.5	0	1	---	None
Cobalt	1.9	0	1	---	6.6	0	1	---	None
Copper	1.3	0	1	---	0.2	0	1	---	None
Iron	0.9	0	1	---	N/A	0	0	---	None
Lead	1.7	0	1	---	0.8	0	1	---	None
Magnesium	1.6	0	1	---	N/A	0	0	---	None
Manganese	1.8	0	2	---	7.3	0	1	---	None
Molybdenum	1.9	0	2	---	1.4	0	1	---	None
Nickel	2.0	0	1	---	7.3	0	1	---	None
Potassium	N/A	0	0	---	N/A	0	0	---	None
Selenium	21.7	**1**	1	100%	14.6	**1**	1	100%	All results qualified J/UJ DL-L
Silver	1.1	0	1	---	0.0	0	1	---	None

Table 4-6
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	Avg. %D	#Ds >10%	# of Valid Results	% Valid Result >10%	Avg. %D	#Ds >10%	# of Valid Results	% Valid Result >10%	
Sodium	3.5	0	1	---	N/A	0	0	---	None
Thallium	3.1	0	1	---	0.8	0	1	---	None
Vanadium	1.4	0	1	---	0.7	0	1	---	None
Zinc	4.2	0	1	---	6.0	0	1	---	None

Qualification on the basis of serial dilution results was limited to the parent groundwater samples for arsenic, beryllium, cadmium, and manganese, as only one of the applicable serial dilution results for each of the four analytes were in excess of 10%, and the average %Ds for all four analytes were less than 10%. Qualification of selenium results as estimated (J/UJ DL-L) was extended to all total fraction results for groundwater samples because the one applicable result was in excess of 10% and the %D was considered more than marginal (i.e., > 15%). For the surface water samples, all selenium results for both the total and dissolved fractions were qualified as estimated because the single measurement was out and the %D was considered to be more than a marginal outage. However, in an overall sense, the serial dilution results are not considered to indicate a pervasive matrix analytical problem.

Site-specific field duplicate samples, rinsate blanks, and field blanks were assessed collectively by matrix for the January 2004 Groundwater and Surface Water Sampling Event to determine the need for qualification of sample results of similar matrices. The sections to follow summarize the results for these QC samples and any collective qualifications arising from the assessments.

5.1 FIELD DUPLICATE AGREEMENT

The field duplicate agreement assessment evaluated the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, as follows. When both concentration results were sufficiently greater (5x) the CRDL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤30%. If one or both of the concentration results were less than 5x the CRDL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤2x the CRDL. Again, the frequency of the field duplicate samples followed the frequency of matrix spike and laboratory duplicate analyses, as the same samples were designated for all QC parameters. The breakdown of field duplicate pair samples per analysis and fraction can be referenced in Table 5-1.

Table 5-1
Summary of Field Duplicate Samples Collected January 2004

Sample ID	Analyses							
	Total Metals	Dissolved Metals	Inorganics	VOCs[1]	SVOCs	Explosives	TPH	BOD/ COD
GROUNDWATER								
EW-5A-T01N-GRW (WAT247C)	X	X	X	---	---	---	---	---
GOATHILLSPRING-T01N-GRW 9AWT241A)	X	X	X	---	---	----	---	---
LABWELL-T01N-GRW (WAT256A)	X	X	X	---	---	---	---	---
MMW-11A-T01N-GRW (WAT258A)	X	X	X	---	---	---	---	---
MMW-21-T01N-GRW (WAT252A)	X	X	X	---	---	---	---	---
MMW-30B-T01N-GRW (WAT251C)	---	---	---	X	---	X	---	---
MMW-48A-T01N-GRW (WAT258A)	X	X	X	X	X	X	X	---
MW-12-T01N-GRW (WAT243C)	X	X	X	---	---	---	---	---
MW-14-T01N-GRW (WAT239C)	X	X	X	---	---	---	---	---
MW-20-T01N-GRW (WAT247C)	X	X	X	---	---	---	---	---
Frequency:	6.0%	6.0%	6.0%	100%	100%	100%	100%	N/A
SURFACE WATER								
RR-DS-SPRING13-T01N-SFW (WAT254S)	X	X	X	---	---	---	---	X
Frequency:	7.7%	7.7%	7.7%	N/A	N/A	N/A	N/A	7.7%

[1] MMW-30B was analyzed by the CLP VOC protocol whereas MMW-48A was analyzed by Method 8260B.

Only one pair of field duplicate samples resulted in the qualification of data on the basis of disagreement, as noted in the sample specific review for data package WAT246C. Total Suspended Solids (TSS) results in samples EW-5A-T01N-GRW and EW-5A-T01D-GRW were qualified as estimated (J) with an indeterminate bias direction assigned, as it was uncertain which of the two results was more accurate. As all other field duplicate comparisons met the criteria as specified in the QAPP, no additional qualifications were considered necessary as a result of the overall assessment. Based on the FD results, the overall level of precision demonstrated is considered to be acceptable.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blanks are prepared in an identical manner to the samples with which they are associated. Table 5-2 summarizes the rinsate blank samples associated with the samples collected during the April Groundwater and Surface water sampling event. The QAPP required frequency of 5% for the collection of rinsate blanks was met for the January 2004 sampling event.

Table 5-2
Summary of Rinsate Blank Samples Collected January 2004

Sample ID	Metals	Inorganics	CLP VOCs	8260 VOCs	Semivolatile Organics (PAHs only)	Explosives	TPH	BOD_5/COD
GROUNDWATER – TOTAL FRACTION								
RB01T-GRW-011204 (WAT251C)	X	X	X	--	---	X	---	---
RB02T-GRW-011404 (WAT257C)	X	X	---	X	---	---	---	---
RB02T-GRWRE-011404 (WAT257C)	---	---	---	--	X	---	X	---
RB03T-GRW-011404 (WAT257C)	X	X	---	--	---	---	---	---
RB04T-GRW-011204 (WAT251C)	X	X	---	--	---	---	---	---
RB05T-GRW-011404 (WAT257C)	X	X	---	--	---	---	---	---
RB06T-GRW-010707 (WAT243C)	X	X	---	--	--	---	---	---
RB07T-GRW-010604 (WAT240C)	X	X	---	--	---	---	---	---
RB08T-GRW-010604 (WAT239C)	X	X	---	--	---	---	---	---
RB09T-GRW-011304 (WAT255C)	X	X	---	--	---	---	---	---
Frequency:	6.0%	6.0%	100%	--	100%	50%	100%	N/A
GROUNDWATER –DISSOLVED FRACTION								
RB01D-GRW-011204 (WAT251C)	X	---	---	--	---	---	---	---
RB02D-GRW-011404 (WAT257C)	X	---	---	--	---	---	---	---
RB03D-GRW-011404 (WAT257C)	X	---	---	--	---	---	---	---
RB04D-GRW-011204 (WAT251C)	X	---	---	--	---	---	---	---
RB05D-GRW-011404 (WAT257C)	X	---	---	--	---	---	---	---
RB06D-GRW-010707 (WAT243C)	X	---	---	--	---	---	---	---
RB07D-GRW-010604 (WAT240C)	X	---	---	--	---	---	---	---
RB08D-GRW-010604 (WAT239C)	X	---	---	--	---	---	---	---
RB09D-GRW-011304 (WAT255C)	X	---	---	--	---	---	---	---
Frequency:	6.0%	N/A	N/A	--	N/A	N/A	N/A	N/A
SURFACE WATER – TOTAL FRACTION								
RB01T-SFW-011304 (WAT2543)	X	X	---	--	---	---	---	X
Frequency:	7.7%	7.7%	N/A	--	N/A	N/A	N/A	100%
SURFACE WATER –DISSOLVED FRACTION								
RB01D-SFW-011304 (WAT2543)	X	---	---	--	---	---	---	X
Frequency:	7.7%	N/A	N/A	--	N/A	N/A	N/A	100%

Table 5-3 summarizes the analytes detected in the associated RI/FS rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered.

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results less than the calculated criteria concentration. In determining the average concentrations, for nondetect values, one half the RL was used to represent the contributing concentration, as opposed to zero, which could potentially bias the average concentration low. Despite the fact that some results were qualified as nondetect on the basis of rinsate blank detections, the rinsate blank results are generally indicative of acceptable decontamination procedures as detections were infrequent and at low levels.

5.3 FIELD BLANK RESULTS

The analyses of organic parameters require field blanks to assure appropriate quality control. The field blank results are utilized to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Table 5-4 summarizes the field blank samples that were collected with the organic samples in this data package. The required QC frequency of 5% was attained.

Table 5-4
Summary of Field Blank Samples Collected January 2004

Sample ID	CLP VOCs	SW 846 8260B VOCs	Semivolatile Organics (PAHs only)	Explosives	TPH
GROUNDWATER –TOTAL FRACTION					
FB01T-GRW-011204 (WAT251C)	1	---	---	1	---
FB02T-GRW-011404 (WAT257C)	---	1	1	---	1
Frequency:	100%	100%	100%	100%	100%

No organic analytes were detected in any of the field blank samples. The field blank results indicate that no contamination of field samples were due to ambient field conditions.

Table 5-3
Summary of Rinsate Blank Results and Additional Qualifications

Analytes	RL	# Detections	Total # Samples	% Detections	Average Conc. (mg/L)	x5 Criteria (mg/L)	Range for Field Samples (mg/L)	Action
GROUNDWATER- TOTAL FRACTION								
Ammonia	0.04	1	9	11.1%	0.053	0.27	0.4-2.7	Sample results ≤ 0.27 mg/L→ U RB-I
Total Alkalinity	1.0	1	9	11.1%	2.8	12.0	1.0-491	Sample results ≤ 12.0 mg/L→ U RB-I
Bicarbonate Alkalinity	1.0	1	9	11.1%	2.8	12.0	1.0-491	Sample results ≤ 12.0 mg/L→ U RB-I
Chloride	0.2	3	9	33.3%	0.16	0.80	0.61-321	Sample results ≤ 0.80 mg/L→ U RB-I
Nitrate	0.2	1	9	11.1%	0.12	0.60	0.2-37.4	Sample results ≤ 0.60 mg/L→ U RB-I
Phosphorus	0.01	1	9	11.1%	0.006	0.030	0.01-34.6	Sample results ≤ 0.030 mg/L→ U RB-I
Ortho-phosphate	0.01	2	9	22.2%	0.007	0.035	0.01-15.5	Sample results ≤ 0.035 mg/L→ U RB-I
TDS	10.0	6	9	66.7%	8.5	42.5	100-23800	Sample results ≤ 42.5 mg/L→ U RB-I
TOC	1.0	2	9	22.2%	0.71	3.55	0.4-11.2	Sample results ≤ 3.55 mg/L→ U RB-I
TSS	0.5	4	9	44.4%	0.41	2.05	0.5-358	Sample results ≤ 2.05 mg/L→ U RB-I
Manganese	19	1	9	11.1%	10.3 (ug/L)	51.5 (ug/L)	11.0-527000	Sample results ≤ 51.5 ug/L→ U RB-I
Nickel	2.4	1	9	11.1%	5.5 (ug/L)	27.5 (ug/L)	2.4-8330	Sample results ≤ 27.5 ug/L→ U RB-I
Chloroform	1.0	1	2	50%	2.65	13.3 (ug/L)	1-55 (ug/L)	Sample results ≤ 0.27 mg/L→ U RB-I
GROUNDWATER- DISSOLVED FRACTION								
Lead	0.2	1	9	11.1%	0.17 (ug/L)	0.85 (ug/L)	0.2-198	Sample results ≤ 0.85 ug/L→ U RB-I
SURFACE WATER- TOTAL FRACTION								
Total Alkalinity	1.0	1	9	11.1%	2.9	14.5	155-157	Sample results ≤ 14.5 mg/L→ U RB-I
Bicarbonate Alkalinity	1.0	1	9	111%	2.9	14.5	155-157	Sample results ≤ 14.5 mg/L→ U RB-I

5.4 TRIP BLANK RESULTS

A trip blank accompanied each cooler of VOC samples to the sampling site, was handled like an environmental sample, and returned to the laboratory for analysis. Two trip blank samples were analyzed to determine the potential introduction of contaminants from sample containers or during the transportation/storage procedures. As acetone was detected in one of the trip blanks, (TB351-GRW), analyzed with data package WAT251C, all volatile organic results were assessed for potential acetone contamination. As all sample results for acetone were nondetect, the possibility of contamination from the above mentioned sources was unlikely.

With the exception of five sample results (all of which were rejected on the basis or poor matrix spike recoveries), all data were considered acceptable for use in meeting project objectives as qualified. Multiple sample results were qualified as nondetect on the basis of laboratory blank or rinsate blank contamination. Others were qualified as estimated on the basis of matrix spike, LCS, or surrogate recoveries. Lastly, several data results were qualified as estimated on the basis of holding time exceedances, serial dilution results, laboratory/field duplicate disagreements, total versus partial disagreements, anion/cation imbalances, or calibration results (for organics). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment for January 2004

Analysis Type	QC Measure	# of Measurements	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	FD	180	179	99.4%
	LD	180	180	100%
Total Metals	FD	225	225	100%
	LD	225	225	100%
Dissolved Metals	FD	225	225	100%
	LD	225	225	100%
Volatile Organics	FD	168	168	100%
	MSD	89	89	100%
Semivolatile Organics	FD	25	25	100%
	MSD	25	25	100%
Explosives	FD	5	5	100%
	MSD	5	5	100%
TPH	FD	1	1	100%
	MSD	1	1	100%
SURFACE WATER				
Inorganics	FD	20	20	100%
	LD	20	20	100%
Total Metal	FD	25	25	100%
	LD	25	25	100%
Dissolved Metals	FD	25	25	100%
	LD	25	25	100%
BOD_5/COD	FD	1	1	100%
	LD	1	1	100%

The percentage of acceptable precision measurements was between 80 to 100% for all parameters. The overall level of precision demonstrated for all analyses collectively was considered to be acceptable.

6.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. These measurements were expressed as percent recoveries for matrix spike (MS), summarized in Table 6-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample-specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters. As such, volatile organic compounds were systematically reviewed and accordingly qualified on the basis of LCS recoveries, as summarized in data packages WAT257C and WAT258A.

Table 6-2
Summary of Accuracy Assessment for January 2004

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	MS	89	84	94.4%
Total Metals	MS	187	175	93.6%
Dissolved Metals	MS	177	170	96%
Volatile Organics	MS/MSD	178	158	88.8%
Semivolatile Organics	MS/MSD	50	50	100%
Explosives	MS/MSD	10	2	20%
TPH	MS/D	1	1	100%
SURFACE WATER				
Inorganics	MS	12	12	100%
Total Metals	MS	22	22	100%
Dissolved Metals	MS	20	20	100%

The percentage of acceptable accuracy measurements ranged from 88.8-100% for all analytes, with the exception of explosives for groundwater. Of the five matrix spikes for explosives, two were marginally below the lower limit of the historical acceptance range. As a conservative approach was undertaken, the parent results for these analytes were qualified. However, as they were just marginally below the acceptance ranges (75% and 68%), their impact on the assessment of accuracy is minimal. With the exception of explosives, the remaining analyses for groundwater resulted in an acceptable range of accuracy measurements from 85-100%. For the explosives analysis, results for two analytes were qualified as estimated and one analyte was rejected based on the accuracy demonstrated. Only one field sample and its field duplicate were affected. No qualifications were issued collectively for any analytes in surface water samples. As such, the overall level of accuracy with respect to the site matrix demonstrated for all analyses collectively was considered to be acceptable.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

With the exception of five metal results and four organic results, all results were considered usable as qualified for meeting project objectives. As such, a percentage of 99% was calculated to represent the completeness of samples, which satisfied the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the groundwater and surface water samples collected during the January 2004 sampling event. The close agreement between the field duplicate results, as discussed in Section 5.1, indicated that the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 4.2 indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analytes. Where possible, the laboratory submitted data from lesser dilutions (for organic analyses), thereby achieving detection limits for non-detects, as specified in the QAPP. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. While it is anticipated that all non-rejected data will be

usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT239C Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 02/16/04

Peer Reviewer: Stacey Coker Date Completed: 02/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
US-2-T01N-GRW	SA	556691	W	X	X
US-2-D01N-GRW	SA	556692	W	X	
MW-23-T01N-GRW	SA	556693	W	X	X
MW-23-D01N-GRW	SA	556694	W	X	
MW-22-T01N-GRW	SA	556695	W	X	X
MW-22-D01N-GRW	SA	556696	W	X	
MW-14-T01N-GRW	SA	556697	W	X	X
MW-14-D01N-GRW	SA	556698	W	X	
MW-14-T01D-GRW	FD	556699	W	X	X
MW-14-D01D-GRW	FD	556700	W	X	
MW-7A-T01N-GRW	SA	556701	W	X	X
MW-7A-D01N-GRW	SA	556702	W	X	
MW-9A-T01N-GRW	SA	556703	W	X	X
MW-9A-D01N-GRW	SA	556704	W	X	
RB08T-GRW	RB	556705	W	X	X
RB08D-GRW	RB	556706	W	X	
MW-26-T01N-GRW	SA	556707	W	X	X
MW-26-D01N-GRW	SA	556708	W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative noted the TKN analysis of the initial calibration verification standard associated with the samples in this delivery group yielded a 115% recovery, in excess of the control

criteria range of 90-110%. TKN was not detected in excess of the reporting limit (0.24 mg/L) in any of the samples in this data group, with the exception of sample MW-26-T01N-GRW, for which a TKN concentration of 0.27 mg/L was reported. Upon review of the TKN extended data, it was additionally noted that the LCS2 and LCSD QC samples reported elevated TKN recoveries (116.7 and 112.5%, respectively), providing further evidence of a potential high bias in the reporting of TKN results. Accordingly, the TKN result for sample MW-26-T01N-GRW was qualified as estimated (J) on the basis of ICV and LCS with a high bias code assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Multiple nitrate, nitrite, and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the prescribed analytical holding time of 48 hours. Results for the aforementioned parameters were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken eight days after sampling and six days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) US-2-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analysis on sample US-2-T01N-GRW was not applicable for all 24 metal analytes, as none of the initial sample results were sufficiently larger (50x) than the IDL, adjusted for dilution. The serial dilution analysis was therefore not useful for evaluating whether significant physical or chemical interferences existed due to the sample matrix. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The selenium concentration of 4.3 µg/L in the filtrate (dissolved) sample MW-23-D01N-GRW was greater than the selenium concentration of 3.0 µg/L in the corresponding total metals sample, MW-23-T01N-GRW. Due to the fact that both values were greater than 5x the RL (0.30 µg/L), the agreement of the two concentrations was compared to an evaluation criterion of ±30%. As the partial concentration exceeded the total by 30.2%, no qualification of data was considered necessary, as this percentage rounded to 30%, within the acceptance range specified in SOP 12.1. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exception of sample RB08*-GRW, which reported a 69.24% difference. As verified independently, the concentrations in this rinsate blank sample were low enough that the reporting limits controlled the calculations. The balance was therefore not an appropriate measure of accuracy. No qualification of data in this delivery group was considered necessary on the basis of cation/anion imbalances.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5, with the exception of RB08*-GRW, which reported a TDS ratio of 1.61. The TDS measured concentration for this sample was 23 mg/L, while the TDS calculated value was 37 mg/L. The TDS calculated value was inflated due to nondetect ion concentrations calculated at the reporting limits. No qualification of data was considered necessary on the basis of TDS ratios. The internal standard recoveries of ^{6}Li were low for the ICPMS analyses of samples MW-23-D01N-GRW, MW-22-T/D01N-GRW, MW-14-T/D01N-GRW, MW-14-T01D/D01D-GRW, MW-7A-T/D01N-GRW, MW-9A-T/D01N-GRW, and MW-26-T/D01N-GRW. Accordingly, the potassium results for these samples, as verified by the run-logs, were reported from the trace ICP. In addition, sample RB08D-GRW reported an elevated recovery for the internal standard ^{89}Y. The analytes associated with this internal standard, beryllium and molybdenum, were reported from the trace ICP. The trace ICP reporting limits for the aforementioned analytes met the requirements of the QAPP such that the change in instrumentation did not affect the usability of the data. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate MW-14-T/D01N-GRW MW-14-T/D01D-GRW • Rinsate Blank • Field Blank • Trip Blank		Field duplicate samples were assessed for overall precision of the analyses. As both field duplicate pairs met the criteria set forth in the QAPP, no qualification of data was necessary on the basis of field duplicate disagreement. The field QC results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate–N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	Ph (std units)
US-2-T01N-GRW	---	---	0.010 UJ	300 J	6.3 J
MW-23-T01N-GRW	---	---	0.022 J	419 J	7.9 J
MW-22-T01N-GRW	0.45 J	0.0050 UJ	0.020 J	221 J	8.3 J
MW-14-T01N-GRW	---	---	0.030 J	877 J	7.4 J
MW-14-T01D-GRW	---	---	0.030 J	886 J	7.4 J
MW-7A-T01N-GRW	---	---	0.047 J	1410 J	7.3 J
MW-9A-T01N-GRW	0.51 J	0.0050 UJ	0.027 J	1250 J	7.4 J
RB08T-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	13.3 J	7.1 J
MW-26-T01N-GRW	---	---	0.16 J	1370 J	8.0 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB 1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Boron	2.5	---	---	---	---	---	2.3	US-2-D01N-GRW US-2-T01N-GRW	U CCB-I
Iron (P)	2375	---	---	2670	2650	---	423	MW-14-T01N-GRW MW-23-D01N-GRW MW-26-T01N-GRW US-2-D01N-GRW US-2-T01N-GRW	U CCB-I
Mercury (CV)	---	-0.1	-0.1	---	---	---	0.1	All samples	UJ CCB-L
Nickel (P)	-4.4	-4.6	-5.0	-4.4	---	-5.609	2.4	All samples	UJ MB, CCB-L J MB, CCB-L
Selenium (MS)	---	---	3.0	---	---	---	0.60	MW-26-D01N-GRW MW-26-T01N-GRW MW-7A-D01N-GRW MW-7A-T01N-GRW MW-9A-D01N-GRW	U CCB-I

P= ICP CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT240C

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 02/17/04

Peer Reviewer: Stacey Coker

Date Completed: 02/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
MW-25-T01N-GRW	SA	556709	W	X	X
MW-25-D01N-GRW	SA	556710	W	X	
MW-29-T01N-GRW	SA	556711	W	X	X
MW-29-D01N-GRW	SA	556712	W	X	
MW-28-T01N-GRW	SA	556713	W	X	X
MW-28-D01N-GRW	SA	556714	W	X	
MW-27-T01N-GRW	SA	556715	W	X	X
MW-27-D01N-GRW	SA	556716	W	X	
MW-15-T01N-GRW	SA	556717	W	X	X
MW-15-D01N-GRW	SA	556718	W	X	
RB07T-GRW	RB	556719	W	X	X
RB07D-GRW	RB	556720	W	X	
MW-1-T01N-GRW	SA	556721	W	X	X
MW-1-D01N-GRW	SA	556722	W	X	
MW-4-T01N-GRW	SA	556723	W	X	X
MW-4-D01N-GRW	SA	556724	W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

As noted in the laboratory case narrative, the alkalinity calibration check standard CCV#1 (01/09/04) yielded a slightly high recovery, in excess of the control criteria of 90-110%. Examination of the raw data verified an elevated recovery of 111.7% for this calibration check standard. As all alkalinity results were associated with this calibration event, all positive results for bicarbonate and total alkalinity results in this data package were qualified as estimated (J) with a high bias direction assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Multiple nitrate, nitrite, and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken seven days after sampling and five days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS MW-1-T01N-GRWS MW-1-D01N-GRWS • PDS MW-1-T01N-GRWA MW-1-D01N-GRWA • LD MW-1-T01N-GRWD MW-1-D01N-GRWD	No	Matrix spike recoveries were reviewed for both inorganics and metals. Only TOC was recovered outside of the acceptance range of 75-125% (138.1%). Accordingly, the TOC result in the parent sample (MW-1-T01N-GRW) was qualified as estimated (J) with a high potential bias. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MW-1-T01N-GRW MW-1-D01N-GRW • Total vs. Partial Analyses Cation/Anion Balance • Internal Standards	No	The serial dilution analyses conducted on matrix spike samples MW-1-T01N-GRW and MW-1-D01N-GRW were not applicable for seven of the 24 metal analytes in each sample, as the remaining 17 analytes exhibited initial concentrations in excess of 50 times the IDL, accounting for dilutions. The percent deviations between the original result and its 5-fold dilution for these analytes were compared to an evaluation criterion of ±10%. Accordingly, arsenic (13.5%) and cadmium (10.5%) in sample MW-1-T01N-GRW were qualified as estimated UJ DL-L and J DL-H, respectively. It is generally held that the diluted (5x) result is the more accurate one of the two. As such, bias directions were determined by comparing the straight analysis result to the diluted one. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exception of sample RB07*-GRW, which reported a 36.92% difference. As verified independently, the concentrations in this rinsate blank sample were low enough that the reporting limits controlled the calculations. The balance was therefore not an appropriate measure of accuracy. No qualification of data in this delivery group was considered necessary on the basis of cation/anion imbalances. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. The internal standard recoveries of ^{6}Li were low for the ICPMS analyses of all samples in this delivery group. Accordingly, the potassium results for these samples, as verified by the run-logs, were reported from the trace ICP. In

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		addition, samples MW-27-T01N-GRW, RB07T-GRW, and RB07D-GRW reported elevated recoveries for the internal standard ^{89}Y. The analytes associated with this internal standard, beryllium and molybdenum, were reported from the trace ICP. The trace ICP reporting limits for the aforementioned analytes met the requirements of the QAPP such that the change in instrumentation did not affect the usability of the data. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	NA	No field QC samples were analyzed with this data package. The field QC results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate–N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
MW-25-T01N-GRW	---	---	---	261 J	7.0 J
MW-29-T01N-GRW	0.24 J	0.0050 UJ	0.026 J	1530 J	7.3 J
MW-28-T01N-GRW	0.27 J	---	0.010 UJ	1210 J	7.3 J
MW-27-T01N-GRW	0.81 J	0.0050 UJ	0.027 J	361 J	7.7 J
MW-15-T01N-GRW	0.34 J	---	---	1720 J	7.3 J
RB07T-GRW	0.20 UJ	---	---	18.5 J	7.0 J
MW-1-T01N-GRW	0.73 J	0.0050 UJ	---	1300 J	7.3 J
MW-4-T01N-GRW	---	---	---	237 J	7.8 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Boron (P)	3.6	2.6	3.6	3.0	3.9	3.175	2.3	MW-27-D01N-GRW MW-27-T01N-GRW MW-28-D01N-GRW MW-4-D01N-GRW MW-4-T01N-GRW	U MB,CCB-I U CCB-I
Chromium (P)	-1.5	---	---	---	---	---	1.5	MW-25-D01N-GRW MW-25-T01N-GRW MW-27-D01N-GRW MW-27-T01N-GRW MW-28-T01N-GRW MW-29-D01N-GRW MW-29-T01N-GRW	UJ CCB-L
Nickel (P)	-5.0	-5.2	-4.8	-4.5	-4.9	-5.633	2.4	All samples qualified	UJ MB,CCB-L
Selenium (MS)	---	---	0.3	---	---	---	0.6	MW-25-D01N-GRW MW-25-T01N-GRW MW-29-D01N-GRW MW-29-T01N-GRW	U CCB-I

P= ICP MS = Mass Spectroscopy CCBx-Continuing Calibration Blank RL = IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT241A

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 02/18/04

Peer Reviewer: Stacey Coker

Date Completed: 02/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
CAPULINSPRING-T01N-GRW	SA	556835	CAPULIINSPRING-T01N-G	W	X	X
CAPULINSPRING-D01N-GRW	SA	556836	CAPULINSPRING-D01N-G	W	X	
GOATHILLSPRING-T01N-GRW	SA	556837	GOATHILLSPRG-T01N-G GOATHILLSPRG-T01N-GRW	W	X	X
GOATHILLSPRING-D01N-GRW	SA	556838	GOATHILLSPRG-D01N-G GOATHILLSPRG-D01N-GRW	W	X	
GOATHILLSPRING-T01D-GRW	FD	556839	GOATHILLSPRG-T01D-G GOATHILLSPRG-T01D-GRW	W	X	X
GOATHILLSPRING-D01D-GRW	FD	556840	GOATHILLSPRG-D01D-G GOATHILLSPRG-D01D-GRW	W	X	
MMW-17A-T01N-GRW	SA	556841		W	X	X
MMW-17A-D01N-GRW	SA	556842		W	X	
MMW-17B-T01N-GRW	SA	556843		W	X	X
MMW-17B-D01N-GRW	SA	556844		W	X	
MMW-47A-T01N-GRW	SA	556984		W	X	X
MMW-47A-D01N-GRW	SA	556985		W	X	
MMW-32A-T01N-GRW	SA	556986		W	X	X
MMW-32A-D01N-GRW	SA	556987		W	X	
WALDOSPRING-T01N-GRW	SA	556988	WALDOSPRING-T01N-GR	W	X	X
WALDOSPRING-D01N-GRW	SA	556989	WALDOSPRNG-D01N-GR	W	X	
SPRING14M-T01N-GRW	SA	556990		W	X	X
SPRING14M-D01N-GRW	SA	556991		W	X	
SPRING-14MA-T01N-GRW	SA	556992		W	X	X
SPRING-14MA-D01N-GRW	SA	556993		W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

As mentioned in the laboratory case narrative, the initial calibration verification standard associated with the samples in this delivery group (ICV) for the analysis of TKN reported a 115% recovery, outside the acceptance range of 90-110%. Accordingly, all positive results for TKN in all samples were qualified as estimated (J), with a high bias direction assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The sample preservation document noted that upon log-in, sample GOATHILLSPRING-T01D-GRW for cyanide analysis was received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH to the sample. The nondetect cyanide result for this sample was qualified as estimated (UJ), with an indeterminate bias direction.
Holding Times	No	Several nitrate, nitrite, and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). As noted in the laboratory case narrative, the original nitrate analyses for samples CAPULINSPRING-T01N-GRW, GOATHILLSPRING-T01N-GRW, and GOATHILLSPRING-T01D-GRW were accomplished within the prescribed analytical holding time. However, chloride interferences required follow-up dilution analyses for these three samples. This resulted in the final nitrate analyses for these samples being accomplished eight days beyond sampling (well over the 2x holding time rule). However, due to the fact that the nitrate results for these three samples were detected, no rejection of nondetect results was necessary. The nitrate results for these three samples were qualified as estimated (J), as summarized in Table 1.1. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 6-8 days after sampling and 5-6 days beyond log-in. The pH for all samples was measured approximately seven and a half hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Mercury and copper were detected in several of the continuing calibration blanks. Accordingly, the majority of mercury results were qualified as estimated, as were several of the copper results. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (A) CAPULINSPRING-T01N-GRW • Total vs. Partial Analyses Cation/Anion Balance • Internal Standards	No	The serial dilution analysis conducted on sample CAPULIN-T01N-GRW was not applicable for 18 of the 24 metal analytes, as only six metal analytes exhibited initial concentrations in excess of 50 times the IDL, accounting for dilutions. The percent deviation between the original result and its 5-fold dilution for these analytes was compared to an evaluation criterion of ±10%. Table 1.3 summarizes the three analytes, which reported percent deviations in excess of 10% and resulted in data qualification in the parent sample. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. The majority of reported cation/anion balances did not meet this criterion. Samples MMW-17A-T/D01N-GRW, MMW-17B-T/D01N-GRW, MMW-47A-T/D01N-GRW, WALDOSPRING-T/D01N-GRW, SPRING14M-T/D01N-GRW, and SPRING14MA-T/D01N-GRW reported cation/anion percent differences ranging from 18.62 to 29.54%. All percent differences were verified independently. The laboratory case narrative noted that the results compared well with historical results. The elevated cation reporting limits (mainly potassium and sodium) associated with dilutions for class "A" samples may be the cause of the elevated percent differences, as nondetects were reported at the reporting limit. No qualifications were issued on the basis of cation/anion balances, as the results were not an appropriate measure of accuracy. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. The internal standard recoveries of ^{89}Y, ^{159}Tb, and ^{6}Li were out for the ICPMS analyses of multiple samples in this delivery group. As all of the affected metal analyte results were reported from the trace ICP, as verified by the run logs, and the reporting limits met the requirement of the QAPP, such that the change in instrumentation did not affect the usability of the data, no qualification was necessary.
Field QC • Field Duplicate GOATHILLSPRING-T01N/T01D-GRW GOATHILLSPRING-D01N/D01D-GRW • Rinsate Blank • Field Blank • Trip Blank		Both field duplicate pairs were assessed for agreement and met the criteria as specified in the QAPP. The field QC results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate–N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
CAPULINSPRING-T01N-GRW	1.6 J	0.11 J	10.2 J	9500 J	2.9 J
GOATHILLSPRING-T01N-GRW	1.3 J	0.078 J	13.6 J	9580 J	2.7 J
GOATHILLSPRING-T01D-GRW	1.3 J	0.078 J	13.7 J	9600 J	2.7 J
MMW-17A-T01N-GRW	---	---	0.010 UJ	685 J	3.8 J
MMW-17B-T01N-GRW	---	---	0.010 UJ	695 J	4.4 J
MMW-47A-T01N-GRW	---	---	---	518 J	5.1 J
MMW-32A-T01N-GRW	---	---	---	1990 J	4.3 J
WALDOSPRING-T01N-GRW	---	---	---	748 J	4.8 J
SPRING14M-T01N-GRW	---	---	---	544 J	4.5 J
SPRING14MA-T01N-GRW	---	---	---	729 J	4.5 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Copper (P)	---	---	---	-10.8	---	---	2.4	SPRING14MA-D01N-GRW SPRING14MA-T01N-GRW SPRING14M-D01N-GRW SPRING14M-T01N-GRW	J CCB-L UJ CCB-L
Mercury (CV)	---	-0.2	-0.1	---	-0.1	---	0.1	CAPULINSPRING-D01N-GRW CAPULINSPRING-T01N-GRW GOATHILLSPRING-D01D-GRW GOATHILLSPRING-D01N-GRW GOATHILLSPRING-T01D-GRW GOATHILLSPRING-T01N-GRW MMW-17A-D01N-GRW MMW-17A-T01N-GRW MMW-17B-D01N-GRW MMW-17B-T01N-GRW MMW-32A-D01N-GRW MMW-32A-T01N-GRW MMW-47A-D01N-GRW MMW-47A-T01N-GRW	UJ CCB-L

P= ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilutions Resulting in
Parent Sample Qualifications

Analyte	%D	Qualification
CAPULINSPRING-T01N-GRW		
Beryllium	41.3	J DL-L parent
Selenium	16.0	
Zinc	10.8	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT242C

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 02/18/04

Peer Reviewer: Stacey Coker

Date Completed: 02/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
US-3-T01N-GRW	SA	556888	W	X	X
US-3-D01N-GRW	SA	556889	W	X	
CC2B-T01N-GRW	SA	556890	W	X	X
CC2B-D01N-GRW	SA	556891	W	X	
CC2A-T01N-GRW	SA	556892	W	X	X
CC2A-D01N-GRW	SA	556893	W	X	
CC1B-T01N-GRW	SA	556894	W	X	X
CC1B-D01N-GRW	SA	556895	W	X	
CC1A-T01N-GRW	SA	556896	W	X	X[2]
CC1A-D01N-GRW	SA	556897	W	X	
MW-B-T01N-GRW	SA	556898	W	X	X
MW-B-D01N-GRW	SA	556899	W	X	
MW-A-T01N-GRW	SA	556900	W	X	X
MW-A-D01N-GRW	SA	556901	W	X	
MW-17-T01N-GRW	SA	556902	W	X	X
MW-17-D01N-GRW	SA	556903	W	X	
MW-10-T01N-GRW	SA	556904	W	X	X
MW-10-D01N-GRW	SA	556905	W	X	
MW-11-T01N-GRW	SA	556906	W	X	X
MW-11-D01N-GRW	SA	556907	W	X	

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Limited inorganics due to the available sample volume.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

As noted in the laboratory case narrative, the calibration check standard CCV#1 (01/12/04) yielded an alkalinity recovery slightly in excess of the control criteria of 90-110%. As the true value for the standard was 100 ppm, the extended data package verified an elevated recovery of 112.3% for this calibration check standard. The positive results for bicarbonate and total alkalinity in the samples associated with this calibration event were qualified as estimated (J) with a high bias direction assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Multiple nitrate, nitrite, and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken six to seven days after sampling and five days beyond log-in. The pH for all samples was measured approximately eight hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) US-3-T01N-GRW • Total vs. Partial Analyses Cation/Anion Balance • Internal Standards	No	The serial dilution analysis conducted on sample US-3-T01N-GRW was not applicable for 23 of the 24 metal analytes, as only calcium exhibited an initial concentration in excess of 50 times the IDL, run at a ten-fold dilution. The percent deviation between the original result and its 5-fold dilution for this analyte was compared to an evaluation criterion of ±10%. As the %D for calcium was not in excess of 10%, no data qualification was necessary on the basis of serial dilution. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. The internal standard recoveries of ^{6}Li were low for the ICPMS analyses of all samples in this delivery group. Accordingly, the potassium results for all samples, as verified by the run-logs, were reported from the trace ICP. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	NA	No field QC samples were analyzed with this data package. The field QC results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
US-3-T01N-GRW	---	---	---	288 J	6.5 J
CC2B-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	1570 J	7.0 J
CC2A-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	1360 J	6.2 J
CC1B-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	610 J	7.5 J
CC1A-T01N-GRW	0.36 J	0.0050 UJ	0.010 UJ	499 J	7.5 J
MW-B-T01N-GRW	0.22 J	0.0081 J	0.010 UJ	1530 J	7.4 J
MW-A-T01N-GRW	0.20 UJ	---	---	987 J	7.2 J
MW-17-T01N-GRW	0.28 J	0.0050 UJ	0.010 UJ	657 J	7.6 J
MW-10-T01N-GRW	---	---	---	213 J	7.8 J
MW-11-T01N-GRW	---	---	---	480 J	8.2 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	---	-49.0	-41.4	---	---	32.9	MW-10-T01N-GRW MW-B-T01N-GRW	UJ CCB-L
Boron (P)	4.5	2.8	---	3.8	2.356	2.3	CC1A-D01N-GRW CC1A-T01N-GRW CC2B-D01N-GRW CC2B-T01N-GRW MW-10-D01N-GRW MW-10-T01N-GRW US-3-D01N-GRW US-3-T01N-GRW	U CCB-I U MB, CCB-I
Chromium (P)	-1.6	-1.5	---	---	---	1.5	CC1A-D01N-GRW CC1A-T01N-GRW CC1B-D01N-GRW CC1B-T01N-GRW CC2B-D01N-GRW CC2B-T01N-GRW MW-17-D01N-GRW MW-17-T01N-GRW MW-A-D01N-GRW MW-A-T01N-GRW MW-B-D01N-GRW MW-B-T01N-GRW US-3-D01N-GRW US-3-T01N-GRW	UJ CCB-L
Iron (P)	---	---	---	---	54.140	37.3	CC1A-T01N-GRW CC2B-D01N-GRW CC2B-T01N-GRW US-3-T01N-GRW	U MB-I
Mercury (CV)	-0.1	-0.1	---	---	---	0.1	CC1A-D01N-GRW CC1A-T01N-GRW CC1B-D01N-GRW CC1B-T01N-GRW CC2A-D01N-GRW CC2A-T01N-GRW CC2B-D01N-GRW CC2B-T01N-GRW MW-17-D01N-GRW MW-17-T01N-GRW MW-A-D01N-GRW MW-A-T01N-GRW MW-B-D01N-GRW MW-B-T01N-GRW US-3-D01N-GRW US-3-T01N-GRW	UJ CCB-L

P= ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT243C

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 02/19/04

Peer Reviewer: Stacey Coker

Date Completed: 02/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
SPRING9-T01N-GRW	SA	556938	W	X	X
SPRING9-D01N-GRW	SA	556939	W	X	
MW-24-T01N-GRW	SA	556940	W	X	X
MW-24-D01N-GRW	SA	556941	W	X	
RB06T-GRW	RB	556942	W	X	X
RB06D-GRW	RB	556943	W	X	
SPRING9A-T01N-GRW	SA	556944	W	X	X
SPRING9A-D01N-GRW	SA	556945	W	X	
SPRING10-T01N-GRW	SA	556946	W	X	X
SPRING10-D01N-GRW	SA	556947	W	X	
MW-12-T01N-GRW	SA	556948	W	X	X
MW-12-D01N-GRW	SA	556949	W	X	
MW-12-T01D-GRW	FD	556950	W	X	X
MW-12-D01D-GRW	FD	556951	W	X	
MW-CH-T01N-GRW	SA	556952	W	X	X
MW-CH-D01N-GRW	SA	556953	W	X	
MW-7C-T01N-GRW	SA	556954	W	X	X
MW-7C-D01N-GRW	SA	556955	W	X	

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

As noted in the laboratory case narrative, the calibration check standard CCV#1 (01/12/04) yielded an alkalinity recovery slightly in excess of the control criteria of 90-110%. As the true value for the standard was 100 ppm, the extended data package verified an elevated recovery of 112.3% for this calibration

check standard. As all alkalinity results were associated with this calibration event, all positive results for bicarbonate and total alkalinity results in this data package were qualified as estimated (J) with a high bias direction assigned.

In addition, the laboratory case narrative noted that during the cyanide analysis on 01/13/04, the associated 50 ppb check standard exhibited a percent recovery that was slightly below the established control limit of 90-110%. Upon review of the raw data, this recovery of 86% was verified for this standard. The analytical sequence revealed that two distilled check standards (50 ppb and 200 ppb) were run after the initial calibration verification (ICV), laboratory control sample (LCS), and initial calibration blank (ICB). As all samples analyzed in this data package for cyanide were bracketed by acceptable continuing calibration verification (CCV) samples and continuing calibration blank (CCB) samples, no qualification of data was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	All nitrate, and the majority of nitrite and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken seven days after sampling and five days beyond log-in. The pH for all samples was measured approximately seven and a half hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	No	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2004GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) SPRING9-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analysis conducted on sample SPRING9-T01N-GRW was not applicable for 23 of the 24 metal analytes, as only calcium exhibited an initial concentration in excess of 50 times the IDL, run at a ten-fold dilution. The percent deviation between the original result and its 5-fold dilution for this analyte was compared to an evaluation criterion of ±10%. As the %D for calcium was not in excess of 10%, no data qualification was necessary on the basis of serial dilution. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exception of sample RB06*-GRW, which reported a 51.06% difference. As verified independently, the concentrations in this rinsate blank sample were low enough that the reporting limits controlled the calculations. The balance was therefore not an appropriate measure of accuracy. No qualification of data in this delivery group was considered necessary on the basis of cation/anion imbalances.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5, with the exception of RB06*-GRW, which reported a TDS ratio of 2.33. The TDS measured concentration for this sample was 12 mg/L, while the TDS calculated value was 28 mg/L. The TDS calculated value was inflated due to nondetect ion concentrations calculated at the reporting limits. No qualification of data was considered necessary on the basis of TDS ratios. The internal standard recoveries of ^{6}Li were low for the ICPMS analyses of all samples in this delivery group. Accordingly, the potassium results for all samples, as verified by the run-logs, were reported from the trace ICP. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate • Rinsate Blank RB06T-GRW RB06D-GRW • Field Blank • Trip Blank	NA	Total dissolved solids (12.0 mg/L) and ammonia-nitrogen (0.084 mg/L) were the only analytes detected in the rinsate blank sample analyzed with this data package. The field QC results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
SPRING9-T01N-GRW	0.63 J	0.005 UJ	0.037 J	1260 J	7.2 J
MW-24-T01N-GRW	1.3 J	0.005 UJ	0.016 J	343 J	7.6 J
RB06T-GRW	0.20 UJ	0.005 UJ	0.010 UJ	0.00 J	7.5 J
SPRING9A-T01N-GRW	0.86 J	0.005 UJ	0.056 J	1150 J	8.0 J
SPRING10-T01N-GRW	0.32 J	0.005 UJ	0.018 J	534 J	8.1 J
MW-12-T01N-GRW	0.40 J	---	---	278 J	8.4 J
MW-12-T01D-GRW	0.44 J	---	---	279 J	8.4 J
MW-CH-T01N-GRW	0.46 J	0.005 UJ	0.010 UJ	483 J	7.8 J
MW-7C-T01N-GRW	0.35 J	0.005 UJ	0.035 J	1640 J	7.4 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Boron (P)	3.5	---	---	2.5	---	2.3	MW-24-D01N-GRW MW-24-T01N-GRW	U CCB-I
Chromium (P)	-5.9	-5.8	-6.0	-6.0	-5.896	1.5	All samples	UJ MB,CCB-L
Mercury (CV)	-0.1	-0.1	-0.1	-0.1	---	0.1		UJ CCB-L
Nickel (P)	-6.4	-6.3	-6.1	-6.3	-6.742	2.4		UJ MB, CCB-L

P= ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT244S

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 02/19/04

Peer Reviewer: Stacey Coker

Date Completed: 02/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
OUTFALL2PIPE-T01N-GRW	SA	556968	OUTFALL2PIPE-T01N-GR	W	X	X
OUTFALL2PIPE-D01N-GRW	SA	556969	OUTFALL-2PIPE-D01N-GR	W	X	
OUTFALL002-T01N-GRW	SA	556970		W	X	X
OUTFALL002-D01N-GRW	SA	556971		W	X	

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative noted the TKN analysis of the initial calibration verification standard associated with the samples in this delivery group yielded a 115.0% recovery, outside the acceptance range of 90-110%. As TKN was not detected in any of the associated field samples above the reporting limit of 0.24 mg/L, no qualification of the data was necessary for the suggested potential high bias.

As noted in the laboratory case narrative, the calibration check standard (CCV#1) associated with the alkalinity analysis of 01/12/04, yielded a 112.3% recovery, slightly in excess of the control criteria of 90-110%. As all samples in this delivery group were associated with this calibration event and reported positive results for total and bicarbonate alkalinity, all results for the aforementioned analytes were qualified as estimated (J), with a potential high bias assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	All nitrate, nitrite, and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken seven days after sampling and five days beyond log-in. The pH for all samples was measured approximately seven and a half hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Mercury and selenium were each detected in one of the continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	No	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) OUTFALL2PIPE-T01N-GRW • Total vs. Partial Analyses Cation/Anion Balance • Internal Standards	No	The serial dilution analysis conducted on sample OUTFALL2-PIPE-T01N-GRW was not applicable for 19 of the 24 metal analytes, as only five metal analytes (Cu, Mg, Mn, Mo, and Na) exhibited initial concentrations in excess of 50 times the IDL. The percent deviation between the original result and its 5-fold dilution for these analytes were compared to an evaluation criterion of ±10%. As none of the %Ds for these analytes were in excess of 10%, no data qualification was necessary on the basis of serial dilution. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. The internal standard recoveries of ^{6}Li were low for the ICPMS analyses of samples OUTFALL002-T01N-GRW and OUTFALL002-D01N-GRW. Accordingly, the potassium results for these samples, as verified by the run-logs, were reported from the trace ICP. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	NA	No field QC samples were analyzed with this data package. The field QC results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs

Review Parameter	Criteria Met?	Comments
		were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate–N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	Ph (std units)
OUTFALL2PIPE-T01N-GRW	0.26 J	0.0050 UJ	0.051 J	1600 J	7.6 J
OUTFALL002-T01N-GRW	0.25 J	0.0050 UJ	0.057 J	1610 J	7.7 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Mercury (CV)	-0.1	---	---	---	0.1	OUTFALL002-T01N-GRW OUTFALL2PIPE-D01N-GRW OUTFALL2PIPE-T01N-GRW	UJ CCB-L
Selenium (MS)	---	0.4	---	---	0.3	OUTFALL002-D01N-GRW OUTFALL002-T01N-GRW OUTFALL2PIPE-D01N-GRW OUTFALL2PIPE-T01N-GRW	U CCB-I

CV = Cold Vapor MS = Mass Spectroscopy CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT245C

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 02/19/04

Peer Reviewer: Stacey Coker

Date Completed: 02/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
LABWELL-T01N-GRW	SA	556994		W	X	X
LABWELL-D01N-GRW	SA	556995		W	X	
LABWELL-T01D-GRW	FD	556996		W	X	X
LABWELL-D01D-GRW	FD	556997		W	X	
MMW-32B-T01N-GRW	SA	556998		W	X	X
MMW-32B-D01N-GRW	SA	556999		W	X	
MMW-3-T01N-GRW	SA	557000		W	X	X
MMW-3-D01N-GRW	SA	557001		W	X	
FAGERQUISTWELL-T01N-GRW	SA	557002	FAGERWELL-T01N-GRW	W	X	X
FAGERQUISTWELL-D01N-GRW	SA	557003	FAGERWELL-D01N-GRW	W	X	
CHAMBERSPRING-T01N-GRW	SA	557004	CHAMBERSPRNG-T01N-CHAMBERSPRNG-T01N-GRW	W	X	X
CHAMBERSPRING-D01N-GRW	SA	557005	CHAMBERSPRNG-D01N-CHAMBERSPRNG-D01N-GRW	W	X	
MMW-8A-T01N-GRW	SA	557006		W	X	X
MMW-8A-D01N-GRW	SA	557007		W	X	
MMW-8B-T01N-GRW	SA	557008		W	X	X
MMW-8B-D01N-GRW	SA	557009		W	X	
SPRING12-T01N-GRW	SA	557010		W	X	X
SPRING12-D01N-GRW	SA	557011		W	X	
SPRING12A-T01N-GRW	SA	557012		W	X	X
SPRING12A-D01N-GRW	SA	557013		W	X	
COMPANYCABINSWELL-T01N-GRW	SA	557014	COMCABSWELL-T01N-COMPCABSWELL-T01N-GRW	W	X	X
COMPANYCABINSWELL-D01N-GRW	SA	557015	COMCABSWELL-D01N-COMPCABSWELL-D01N-GRW	W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

In addition, the laboratory case narrative noted that during the cyanide analysis, the associated distilled 200 ppb check standard exhibited a percent recovery that was slightly above the established control limit of 90-110%. Upon review of the raw data, a slightly altered situation was uncovered. The analysis of the cyanide data in this data package was accomplished in two analytical sequences. All samples, with the exception of one (COMPANYCABINSWELL-T01N-GRW) were analyzed on 01/16/04. COMPANYCABINSWELL-T01N-GRW was analyzed on 01/17/04. Both analytical sequences revealed that two distilled check standards (50 ppb and 200 ppb) were run after the initial calibration verification (ICV), laboratory control sample (LCS), and initial calibration blank (ICB). Both extra 50 ppb and 200 ppb check standards run on 01/16/04 yielded acceptable recoveries, 97.2% and 97.3%, respectively. The extra 50 ppb check standard run on 01/17/04 reported an acceptable recovery of 91.1%. The extra 200 ppb check standard reported a recovery of 7.9%, well below the lower level of the acceptance level. The laboratory suspected that the low 200 ppm recovery was likely due to a spike error on behalf of the analyst. However, as all samples analyzed in this data package for cyanide were bracketed by acceptable continuing calibration verification (CCV) samples and continuing calibration blank (CCB) samples, and were nondetect, no qualification of data was considered necessary.

The laboratory case narrative noted that due to an oversight by the analyst, the post-digestion spike was not performed for cyanide. As the matrix spike for cyanide exhibited an acceptable recovery, the post digestion spike information was not necessary for review to determine the accuracy of the recovery of cyanide. This did not affect the quality or the usability of the data.

The laboratory case narrative noted the ammonia analysis of the replicate associated with sample FAGERQUISTWELL-T01N-GRW yielded a Relative Percent Difference (RPD) in excess of control criteria (46%). However, when utilizing the criterion specified in the SOP 12.1, no qualification of ammonia results on the basis of replicate disagreement was necessary. Due to the fact that neither concentration was sufficiently larger than (5x) the Reporting Limit (RL) (0.040 mg/L), the absolute difference between the two concentrations was compared to an evaluation criteria of 2x the RL.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory log-in sheet noted there was a conflict between the collection times recorded on the COC and the bottle for sample MMW-8B-T01N-GRW. The laboratory recorded the time on the bottle. This inadvertent error did not affect the quality or usability of the data. The sample preservation document noted that upon log-in, samples LABWELL-T01N-GRW and LABWELL-T01D-GRW for cyanide analyses were received at reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH to the samples. The nondetect cyanide results for the total fractions of these samples were qualified as estimated (UJ), with an indeterminate bias direction.
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		samples were taken six to seven days after sampling and five days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD FAGERQUISTWELL-T01N-GRWMS FAGERQUISTWELL-D01N-GRWMS • PDS FAGERQUISTWELL-T01N-GRWL FAGERQUISTWELL-D01N-GRWL • LD FAGERQUISTWELL-T01N-GRWD FAGERQUISTWELL-D01N-GRWD	Yes	All recoveries for both the inorganic and metal matrix spike analyses were within the acceptance range of 75-125%. No qualification was necessary on the basis of matrix spike recoveries. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) FAGERQUISTWELL-T01N-GRW FAGERQUSITWELL-D01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses conducted on matrix spike samples FAGERQUISTWELL-T01N-GRW and FAGERQUISTWELL-D01N-GRW were not applicable for eight of the 24 metal analytes, as 13 metal analytes exhibited initial concentrations in excess of 50 times the IDL, accounting for dilutions. The percent deviation between the original result and its 5-fold dilution for these analytes were compared to an evaluation criterion of ±10%. As all %Ds for the applicable metal analytes in each serial dilution sample were less than 10%, no data qualification was necessary. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. The internal standard recovery of ^{6}Li was low for the ICPMS analysis of sample MMW-8B-D01N-GRW. Accordingly, the potassium result for this sample, as verified by the run-logs, was reported from the trace ICP. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate LABWELL-T01N/T01D-GRW LABWELL-D01N/D01D-GRW • Rinsate Blank • Field Blank • Trip Blank	NA	Field duplicate pairs were assessed for overall precision of the analyses. As all the criteria as specified in SOP 12.1 was met, no qualification of data was necessary on the basis of field duplicate disagreement. The field QC results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Cond. (µmhos/cm)	pH (std units)
LABWELL-T01N-GRW	292 J	6.8 J
LABWELL-T01D-GRW	296 J	7.0 J
MMW-32B-T01N-GRW	2480 J	6.9 J
MMW-3-T01N-GRW	2100 J	7.0 J
FAGERQUISTWELL-T01N-GRW	145 J	7.2 J
CHAMBERSPRING-T01N-GRW	242 J	8.0 J
MMW-8A-T01N-GRW	2320 J	7.2 J
MMW-8B-T01N-GRW	2110 J	6.0 J
SPRING12-T01N-GRW	454 J	7.9 J
SPRING12A-T01N-GRW	373 J	8.0 J
COMPANYCABINSWELL-T01N-GRW	159 J	7.4 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Boron (P)	5.1	3.5	4.8	4.2	2.963	2.3	FAGERQUISTWELL-D01N-GRW FAGERQUISTWELL-T01N-GRW LABWELL-D01D-GRW LABWELL-D01N-GRW LABWELL-T01D-GRW LABWELL-T01N-GRW MMW-32B-D01N-GRW MMW-32B-T01N-GRW MW-3-D01N-GRW MW-3-T01N-GRW	U MB,CCB-I U CCB-L
Beryllium (P)	---	.10	-1.9	---	-2.150	1.0	CHAMBERSPRING-D01N-GRW CHAMBERSPRING-T01N-GRW COMPANYCABINSWELL-D01N-GRW COMPANYCABINSWELL-T01N-GRW MMW-8A-D01N-GRW MMW-8A-T01N-GRW MMW-8B-D01N-GRW MMW-8B-T01N-GRW SPRING12A-D01N-GRW SPRING12A-T01N-GRW SPRING12-D01N-GRW SPRING12-T01N-GRW	UJ MB, CCB-L
Cadmium (P)	---	-0.8	---	---	---	0.7	CHAMBERSPRING-D01N-GRW CHAMBERSPRING-T10N-GRW COMPANYCABINSWELL-D01N-GRW COMPANYCABINSWELL-T01N-GRW MMW-8A-D01N-GRW MMW-8A-T01N-GRW SPRING12A-D01N-GRW SPRING12A-T01N-GRW SPRING12-D01N-GRW SPRING12-T01N-GRW	UJ CCB-L
Chromium (P)	-3.3	-3.7	-3.9	-3.4	-3.121	1.5	FAGERQUISTWELL-D01N-GRW FAGERQUISTWELL-T01N-GRW LABWELL-D01D-GRW LABWELL-D01N-GRW LABWELL-T01D-GRW LABWELL-T01N-GRW MMW-32B-D01N-GRW MMW-32B-T01N-GRW MW-3-D01N-GRW MW-3-T01N-GRW	UJ MB, CCB-L
Nickel (P)	-15.5	-15.4	-15.0	-15.7	-15.87	2.4	FAGERQUISTWELL-D01N-GRW FAGERQUISTWELL-T01N-GRW LABWELL-D01D-GRW LABWELL-D01N-GRW LABWELL-T01D-GRW LABWELL-T01N-GRW MMW-32B-D01N-GRW MMW-32B-T01N-GRW MW-3-D01N-GRW MW-3-T01N-GRW	UJ MB,CCB-L
Potassium (P)	---	---	2135	---	---	1099	COMPANYCABINSWELL-D01N-GRW COMPANYCABINSWELL-T01N-GRW	U CCB-I

P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT246C

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 02/19/04

Peer Reviewer: Stacey Coker

Date Completed: 02/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
003CENTRALSEEP-T01N-GRW	SA	557016	003-CNTRLSEEP-T01N-GRW 003CNTRLSEEP-T01N-GR	W	X	X
003CENTRALSEEP-D01N-GRW	SA	557017	003-CNTRLSEEP-D01N-GRW 003CNTRLSEEP-S01N-GR	W	X	
003-WESTSEEP-T01N-GRW	SA	557018	003WESTSEEP-T01N-GR	W	X	X
003WESTSEEP-D01N-GRW	SA	557019	003WESTSEEP-D01N-GR	W	X	
003EASTSEEP-T01N-GRW	SA	557020	003EASTSEEP-T01N-GR	W	X	X
003EASTSEEP-D01N-GRW	SA	557021	003EASTSEEP-D01N-GR	W	X	
WESTSEEP-T01N-GRW	SA	557022		W	X	X
WESTSEEP-D01N-GRW	SA	557023		W	X	
MW-2-T01N-GRW	SA	557024		W	X	X
MW-2-D01N-GRW	SA	557025		W	X	
MW-13-T01N-GRW	SA	557026		W	X	X
MW-13-D01N-GRW	SA	557027		W	X	
US-1-T01N-GRW	SA	557028		W	X	X
US-1-D01N-GRW	SA	557029		W	X	
EW-3-T01N-GRW	SA	557030		W	X	X
EW-3-D01N-GRW	SA	557031		W	X	
EW-5A-T01N-GRW	SA	557032		W	X	X
EW-5A-D01N-GRW	SA	557033		W	X	
EW-5A-T01D-GRW	FD	557034		W	X	X
EW-5A-D01D-GRW	FD	557035		W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The Initial Calibration Verification associated with the cyanide analysis of the data in this package resulted in a recovery of 111.7%, slightly exceeding the acceptance range of 90-110%. Due to the fact that cyanide was not reported in any sample above the reporting limit, all results were considered to be reportable without any corrective action. Consequently, the potential high bias suggested by the elevated ICV recovery did not result in the qualification of data.

In addition, the laboratory case narrative noted that during the cyanide analysis, the associated distilled 200 ppb check standard exhibited no recovery for cyanide. Upon review of the raw data, a slightly altered situation was uncovered. The samples in this data package were analyzed for cyanide in three analytical sequences (01/16/04, 01/17/14, and 01/19/04). All analytical sequences revealed that two distilled check standards (50 ppb and 200 ppb) were run after the initial calibration verification (ICV), laboratory control sample (LCS), and initial calibration blank (ICB).

- Samples with the laboratory IDs 557016-557028 were analyzed on 01/16/04. Both additional 50 ppb and 200 ppb check standards were recovered within the acceptance range of 90-110%.
- Sample EW-5A-T01N-GRW (557032) was analyzed on 01/17/04 with the extra 50 ppb standard for which an acceptable recovery was reported. However, the recovery of the 200 ppb standard recovery was 7.8%. The laboratory suspected that this low 200 ppm recovery was the result of a spiking error.
- Sample EW-3-T01N-GRW (557030) reported slightly elevated recoveries for both of the extra 50 ppb and 200 ppb standards (119.8%, and 117.5%, respectively).

However, as all samples analyzed in this data package for cyanide were bracketed by acceptable continuing calibration verification (CCV) samples and continuing calibration blank (CCB) samples, and were nondetect, no qualification of data was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, samples 003WESTSEEP-T01N-GRW, 003EASTSEEP-T01N-GRW, EW-5A-T01N-GRW, and EW-5A-T01D-GRW for cyanide analysis were received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect results for these samples were qualified as estimated (UJ), with an indeterminate bias direction. The sample preservation document noted that upon log-in, samples 003CENTRALSEEP-D01N-GRW and US-1-D01N-GRW, for the analysis of metals, were received with a pH greater than 2 and subsequently required the addition of HNO_3^- to attain the proper pH for preservation. No qualification was necessary for the metal results for these two samples due to the fact that the nitric acid added would have dissolved most of the metals that might have precipitated out. This was further supported by the observation that the dissolved metal concentrations were comparable to the total metal concentrations.
Holding Times	No	All nitrate, nitrite, and orthophosphate results (with the exception of one nitrite result) were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		taken seven days after sampling and five days beyond log-in. The pH for all samples was measured approximately five and a half hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD US-1-T01N-GRW US-1-D01N-GRW • PDS US-1-T01N-GRWA US-1-D01N-GRWA • LD US-1-T01N-GRWREP US-1-D01N-GRWREP	No	The matrix spike analyses for both inorganics and metals yielded recoveries within the acceptance range of 75-125% for all analytes, with the exception of ammonia-nitrogen (72.5%) and Total Organic Carbon (60.0%). Accordingly, results for both analytes in the parent sample (US-1-T01N-GRW) were qualified as estimated (UJ) with a low bias direction assigned. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) US-1-T01N-GRW US-1-D01N-GRW • Total vs. Partial Analyses Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses conducted on matrix spike samples US-1-T01N-GRW and US-1-D01N-GRW were not applicable for seven of the 24 metal analytes, as 17 metal analytes exhibited initial concentrations in excess of 50 times the IDL, accounting for dilutions. The percent deviation between the original result and its 5-fold dilution for these analytes was compared to an evaluation criterion of ±10%. As all %Ds for the applicable metal analytes in each serial dilution sample were less than 10%, no data qualification was necessary. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. The internal standard recoveries of ^{6}Li were low for the ICPMS analyses of all samples in this data package. Accordingly, the potassium results for all samples, as verified by the run-logs, were reported from the trace ICP. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate EW-5A-T01N/T01D-GRW EW-5A-D01N/D01D-GRW • Rinsate Blank • Field Blank • Trip Blank	No	Field duplicate pairs were assessed for overall precision of the analyses. The Total Suspended Solids (TSS) results for samples EW-5A-T01N-GRW and EW-5A-T01D-GRW were qualified as estimated (J) on the basis of field duplicate pair disagreement. The absolute difference between the two reported concentrations (1.5 mg/L) was compared to an evaluation criteria of ≤2x RL (≤ 1.0 mg/L), as neither sample was greater than 5x the RL. The field QC results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate–N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
003CENTRALSEEP-T01N-GRW	0.25 J	0.0050 UJ	0.026 J	2270 J	7.6 J
003WESTSEEP-T01N-GRW	0.20 UJ	0.0050 UJ	0.021 J	2130 J	7.6 J
003EASTSEEP-T01N-GRW	0.20 UJ	0.0050 UJ	0.014 J	1880 J	7.8 J
WESTSEEP-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	1480 J	7.5 J
MW-2-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	803 J	8.4 J
MW-13-T01N-GRW	0.56 J	0.0050 UJ	0.015 J	623 J	8.1 J
US-1-T01N-GRW	0.31 J	---	0.010 UJ	312 J	7.0 J
EW-3-T01N-GRW	0.35 J	0.0050 UJ	0.013 J	1360 J	7.2 J
EW-5A-T01N-GRW	0.20 UJ	0.0050 UJ	0.11 J	1720 J	7.4 J
EW-5A-T01D-GRW	0.20 UJ	0.0050 UJ	0.11 J	1740 J	7.4 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification code
Beryllium (P)	---	---	-1.4	-1.7	---	1.0	EW-3-D01N-GRW EW-3-T01N-GRW EW-5A-D01D-GRW EW-5A-D01N-GRW EW-5A-T01D-GRW EW-5A-T01N-GRW MW-13-D01N-GRW MW-13-T01N-GRW MW-2-D01N-GRW MW-2-T01N-GRW US-1-D01N-GRW US-1-T01N-GRW	UJ CCB-L
Copper (P)	3.7	---	---	---	---	3.5	003EASTSEEP-T01N-GRW 003WESTSEEP-T01N-GRW	U CCB-I
Selenium (MS)	---	0.3	---	---	0.690	0.3	All samples with the **exception of**: US-1-T01N-GRW	U MB,CCB-I U MB-I

P= ICP MS = Mass Spectroscopy CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT247C

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 02/20/04

Peer Reviewer: Stacey Coker

Date Completed: 02/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
EW-1-T01N-GRW	SA	557036		W	X	X
EW-1-D01N-GRW	SA	557037		W	X	
EW-2-T01N-GRW	SA	557038		W	X	X
EW-2-D01N-GRW	SA	557039		W	X	
EMBARGOROADSEEP-T01N-GRW	SA	557040	EMBRGORDSEEP-T01N-GRW EMBRGORDSEEP-T01N-	W	X	X
EMBARBOROADSEEP-D01N-GRW	SA	557041	EMBRGORDSEEP-D01N-GRW EMBRGORDSEEP-D01N-	W	X	
MW-20-T01N-GRW	SA	557042		W	X	X
MW-20-D01N-GRW	SA	557043		W	X	
MW-20-T01D-GRW	FD	557044		W	X	X
MW-20-D01D-GRW	FD	557045		W	X	
MW-21-T01N-GRW	SA	557046		W	X	X
MW-21-D01N-GRW	SA	557047		W	X	
EW-6-T01N-GRW	SA	557048		W	X	X
EW-6-D01N-GRW	SA	557049		W	X	
EW-5B-T01N-GRW	SA	557050		W	X	X
EW-5B-D01N-GRW	SA	557051		W	X	
EW-5C-T01N-GRW	SA	557052		W	X	X
EW-5C-D01N-GRW	SA	557053		W	X	
EW-5D-T01N-GRW	SA	557054		W	X	X
EW-5D-D01N-GRW	SA	557055		W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

In addition, the laboratory case narrative noted that during the cyanide analysis, the associated distilled 50 ppb check standard exhibited a percent recovery that was slightly below the established control limit of 90-110%. Upon review of the raw data, a recovery of 89.2% was verified for this standard. The analytical sequence revealed that two distilled check standards (50 ppb and 200 ppb) were run after the initial calibration verification (ICV), laboratory control sample (LCS), and initial calibration blank (ICB). As all samples analyzed in this data package for cyanide were bracketed by acceptable continuing calibration verification (CCV) samples and continuing calibration blank (CCB) samples, and were nondetect, no qualification of data was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, sample MW-20-T01D-GRW, for the analysis of metals, was received with a pH greater than 2 and subsequently required the addition of HNO_3^- to attain the proper pH for preservation. No qualification was necessary for the metal results for this sample due to the fact that the nitric acid added would have dissolved most of the metals that might have precipitated out. This was further supported by the observation that the dissolved metal concentration was comparable to the total metal concentration for this sample.
Holding Times	No	All nitrate, and the majority of nitrite, and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken seven days after sampling and five days beyond log-in. The pH for all samples was measured approximately five and a half hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Selenium was the only metal analyte detected in a continuing calibration blank. As such, multiple sample results for selenium were qualified as nondetect with an indeterminate bias direction. Table 1.2 summarizes the blank detection and the resultant data qualifications.
Matrix QC • MS/MSD EW-6-T01N-GRWS EW-6-D01N-GRWS • PDS EW-6-T01N-GRWA EW-6-D01N-GRWA • LD EW-6-T01N-GRWREP EW-6-D01N-GRWREP	No	The matrix spike analyses for both inorganics and metals yielded recoveries within the acceptance range of 75-125% for all analytes, with the exception of ammonia-nitrogen, which recovered the matrix spike at 34.2%. Accordingly, the ammonia nitrogen result for the parent sample (EW-6-T01N-GRW) was qualified as estimated (UJ) with a low bias direction assigned. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Surrogates • Serial Dilution (C) EW-6-T01N-GRW EW-6-D01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses conducted on matrix spike samples EW-6-T01N-GRW and EW-6-D01N-GRW were not applicable for seven of the 24 metal analytes, as 17 metal analytes exhibited initial concentrations in excess of 50 times the IDL, accounting for dilutions. The percent deviation between the original result and its 5-fold dilution for these analytes was compared to an evaluation criterion of ±10%. As all %Ds for the applicable metal analytes in each serial dilution sample were less than 10%, no data qualification was necessary. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. The internal standard recoveries of ^{6}Li were low for the ICPMS analyses of samples EMBARGOROADSEEP-T01N-GRW, EW-5B-D01N-GRW, EW-5C-T01N-GRW, EW-5C-D01N-GRW, EW-5D-T01N-GRW, and EW-5C-D01N-GRW in this data package. Accordingly, the potassium results for these samples, as verified by the run-logs, were reported from the trace ICP. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate MW-20-T01N/T01D-GRW MW-20-D01N/D01D-GRW • Rinsate Blank • Field Blank • Trip Blank	N/A	Field duplicate samples were assessed for overall precision of the analyses. As both field duplicate pairs met the criteria set forth in the QAPP, no qualification of data was necessary on the basis of field duplicate disagreement. The field QC results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	Ph (std units)
EW-1-T01N-GRW	0.65 J	0.0050 UJ	0.029 J	654 J	7.8 J
EW-2-T01N-GRW	0.62 J	0.0050 UJ	0.013 J	484 J	8.0 J
EMBARGOROADSEEP-T01N-GRW	0.52 J	0.0050 UJ	0.023 J	1290 J	7.5 J
MW-20-T01N-GRW	2.0 J	0.0050 UJ	0.029 J	435 J	7.6 J
MW-20-T01D-GRW	2.0 J	0.0050 UJ	0.029 J	430 J	7.6 J
MW-21-T01N-GRW	9.0 J	---	---	1100 J	7.6 J
EW-6-T01N-GRW	0.45 J	0.0050 UJ	0.026 J	1470 J	7.5 J
EW-5B-T01N-GRW	0.20 J	0.0050 UJ	0.097 J	1640 J	7.4 J
EW-5C-T01N-GRW	0.20 J	0.0050 UJ	0.019 J	1800 J	7.3 J
EW-5D-T01N-GRW	0.23 J	0.0050 UJ	0.010 UJ	1920 J	7.3 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	CCB7 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Selenium (MS)	---	0.5	---	---	---	0.3	EW-1-T01N-GRW EW-1-D01N-GRW EW-2-T01N-GRW EW-2-D01N-GRW EMBARGOROADSEEP-T01N-GRW EMBARGOROADSEEP-D01N-GRW MW-20-T01N-GRW MW-20-D01N-GRW MW-20-T01D-GRW MW-20-D01D-GRW EW-6-T01N-GRW	U CCB-I

MS = Mass Spectroscopy CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT248C

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 02/20/04

Peer Reviewer: Stacey Coker

Date Completed: 02/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
SPRING14T-T01N-GRW	SA	557056	X	X	X
SPRING14T-D01N-GRW	SA	557057	X	X	
LS-2-T01N-GRW	SA	557058	X	X	X
LS-2-D01N-GRW	SA	557059	X	X	
LS-1-T01N-GRW	SA	557060	X	X	X
LS-1-D01N-GRW	SA	557061	X	X	
SPRING18-T01N-GRW	SA	557062	X	X	X
SPRING18-D01N-GRW	SA	557063	X	X	
SPRING15T-T01N-GRW	SA	557064	X	X	X
SPRING15T-D01N-GRW	SA	557065	X	X	
LS-3-T01N-GRW	SA	557066	X	X	X
LS-3-D01N-GRW	SA	557067	X	X	
SPRING17-T01N-GRW	SA	557068	X	X	X
SPRING17-D01N-GRW	SA	557069	X	X	

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative noted that due to an oversight by the analyst, the post-digestion spike was not performed for cyanide. As the matrix spike for cyanide exhibited an acceptable recovery, the post digestion spike information was not necessary for review to determine the accuracy of the recovery of cyanide. This did not affect the quality or the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The sample preservation document noted that upon log-in, samples LS-2-T01N-GRW, LS-1-T01N-GRW, SPRING18-T01N-GRW, and SPRING15T-T01N-GRW for cyanide analyses were received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect results for these samples were qualified as estimated (UJ), with an indeterminate bias direction. The sample preservation document noted that upon log-in, sample LS-1-D01N-GRW, for the analysis of metals, was received with a pH greater than 2 and subsequently required the addition of HNO_3^- to attain the proper pH for preservation. No qualification was necessary for the metal results for this sample due to the fact that the nitric acid added would have dissolved most of the metals that might have precipitated out. This was further supported by the observation that the dissolved metal concentrations were comparable to the total metal concentrations.
Holding Times	No	The majority of nitrate, nitrite, and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 13 days after sampling and 11 days beyond log-in. The pH for all samples was measured approximately six hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Mercury and selenium were detected in several of the continuing calibration blanks resulting in qualification of all of the mercury results and several of the selenium results as nondetect with an indeterminate bias direction. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD SPRING17-T01N-GRWMS SPRING17-D01N-GRWMS • PDS SPRING17-T01N-GRWA SPRING17-D01N-GRWA • LD SPRING17-T01N-GRWREP SPRING17-D01N-GRWREP	No	The matrix spike analyses for both inorganics and metals yielded recoveries within the acceptance range of 75-125% for all analytes, with the exception of Total Organic Carbon (TOC), which recovered the matrix spike at 68.4%. Accordingly, the TOC result for the parent sample (SPRING17-T01N-GRW) was qualified as estimated (UJ) with a low bias direction assigned. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) SPRING17-D01N-GRW SPRING17-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses conducted on matrix spike samples SPRING17-T01N-GRW and SPRING17-D01N-GRW were not applicable for three of the 24 metal analytes, as the majority of metal analytes (21) exhibited initial concentrations in excess of 50 times the IDL, accounting for dilutions. The percent deviation between the original result and its 5-fold dilution for these analytes was compared to an evaluation criterion of ±10%. Only one analyte (selenium) in parent sample SPRING17-T01N-GRW reported a percent deviation in excess of 10%. Accordingly, the selenium result in this sample was qualified as estimated (UJ), with a low bias code assigned. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The results for both Phosphorus and Orthophosphate were qualified as estimated (J/UJ) in samples SPRING18-T01N-GRW and LS-3-T01N-GRW on the basis of total versus partial disagreement. Table 1.3 summarizes the

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		concentrations for each of theses analytes along with the qualifications assigned. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. The internal standard recoveries of ^{6}Li were low for the ICPMS analyses of all samples in this data package. Accordingly, the potassium results for all samples, as verified by the run-logs, were reported from the trace ICP. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	NA	No field QC samples were analyzed with this data package. The field QC results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate–N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
SPRING14T-T01N-GRW	0.39 J	0.005 UJ	0.012 J	434 J	8.1 J
LS-2-T01N-GRW	0.20 UJ	0.005 UJ	0.011 J	425 J	7.0 J
LS-1-T01N-GRW	0.23 J	---	---	462 J	6.8 J
SPRING18-T01N-GRW	0.46 J	0.005 UJ	0.025 J	309 J	8.2 J
SPRING15T-T01N-GRW	0.42 J	0.005 UJ	0.015 J	240 J	8.3 J
LS-3-T01N-GRW	0.22 J	0.005 UJ	0.10 J	379 J	7.2 J
SPRING17-T01N-GRW	0.37 J	0.005 UJ	0.011 J	395 J	7.4 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Mercury (CV)	---	-0.2	-0.1	---	-0.1	---	0.1	All Samples Qualified	UJ CCB-L
Selenium (P)	---	0.4	---	---	---	---	0.6	LS-1-T01N-GRW LS-3-T01N-GRW SPRING14T-T01N-GRW SPRING15T-T01N-GRW SPRING18-D01N-GRW SPRING18-T01N-GRW	U CCB-I

P= ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications

Sample	Ortho-phosphate (mg/L)	Total Phosphate (mg/L)	RL (mg/L)	Evaluation Criterion	Qualification Code
SPRING18-T01N-GRW	0.010 U	0.025	0.010	2x RL	UJ/J TvP-I
LS-3-T01N-GRW	0.010 U	0.10	0.010	2x RL	UJ/J TvP-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT249A

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 2/11/04

Peer Reviewer: Stacey Coker

Date Completed: 2/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
MMW-44A-T01N-GRW	SA	557231		W	X	X
MMW-44A-D01N-GRW	SA	557232		W	X	
COLUMBINE NO 1-T01N-GRW	SA	557233	COLUMBINENO1-T01N-G	W	X	X
COLUMBINE NO 1-D01N-GRW	SA	557234	COLUMBINENO1-D01N-G	W	X	
COLUMBINE NO 2-T01N-GRW	SA	557235	COLUMBINENO2-T01N-G	W	X	X
COLUMBINE NO 2-D01N-GRW	SA	557236	COLUMBINENO2-D01N-G	W	X	
MMW-10C-T01N-GRW	SA	557237		W	X	X
MMW-10C-D01N-GRW	SA	557238		W	X	
MMW-19A-T01N-GRW	SA	557239		W	X	X
MMW-19A-D01N-GRW	SA	557240		W	X	
MMW-24-T01N-GRW	SA	557241		W	X	X
MMW-24-D01N-GRW	SA	557242		W	X	
MMW-27A-T01N-GRW	SA	557243		W	X	X
MMW-27A-D01N-GRW	SA	557244		W	X	
MMW-45B-T01N-GRW	SA	557245		W	X	X
MMW-45B-D01N-GRW	SA	557246		W	X	
MMW-45A-T01N-GRW	SA	557247		W	X	X
MMW-45A-D01N-GRW	SA	557248		W	X	
MMW-2-T01N-GRW	SA	557249		W	X	X
MMW-2-D01N-GRW	SA	557250		W	X	
MMW-36B-T01N-GRW	SA	557251		W	X	X
MMW-36B-D01N-GRW	SA	557252		W	X	
MMW-34B-T01N-GRW	SA	557253		W	X	X
MMW-34B-D01N-GRW	SA	557254		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

The second alkalinity continuing calibration verification standard (CCV2) analyzed on 1/20/04 yielded a slightly high recovery (CCV2 =114%), outside the acceptance range of 90-110%. However, CCV2 did not bracket sample MMW-27A-T01N-GRW, which was the only sample in this SDG analyzed on 1/20/04. Therefore, no qualification was considered necessary.

Also, the fifth sulfate continuing calibration verification standard (CCV5) analyzed on 1/20/04 yielded a slightly low recovery (CCV5 =89%), outside the acceptable range of 90-110%. The other five CCVs analyzed on this date were all within limits. Therefore, only the sulfate sample results associated with CCV5 were qualified as estimated UJ/J CCV-L.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The original nitrate sample results for MMW-44A-T01N-GRW and MMW-24-T01N-GRW were analyzed within the 48-hour holding time, but yielded nitrate concentrations above the calibration range. These two samples were reanalyzed 9 days beyond the holding time at appropriate dilutions. For a few samples, the 48-hour holding time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 10 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Boron and mercury were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS MMW-27A-T01N-GRW MMW-27A-D01N-GRW • LD	No	Matrix spike analyses were conducted on samples MMW-27A-T01N-GRW and MMW-27A-D01N-GRW. Eight matrix spike results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-27A-T01N-GRW MMW-27A-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analysis was conducted on samples MMW-27A-T01N-GRW and MMW-27A-D01N-GRW, (pH class A), and was applicable for 2 out of 24 analytes. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples MMW-44A-T01N/D01N-GRW, MMW-45B-T01N/D01N-GRW, MMW-45A-T01N/D01N-GRW, MMW-2-T01N-GRW, and MMW-34B-T01N/D01N-GRW. Therefore, beryllium and molybdenum results for all samples were reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Li was low for the ICPMS analysis of sample MMW-34B-D01N-GRW. Therefore, potassium results for all samples were reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		For samples MMW-44A-T01N-GRW, MMW-19A-T01N-GRW, MMW-27A-T01N-GRW, and MMW-45B-T01N-GRW, the analysis of orthophosphate exceeded that of the total phosphorus analysis beyond variation expected due to the accuracy limitations of the method. Table 1.4 summarizes these results and the data qualification. For sample MMW-27A-T01N/D01N-GRW, the analysis of dissolved nickel exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Also, in sample MMW-45A-T01N-GRW, the analysis of dissolved lead exceeded that of the total analysis beyond variation expected due to the accuracy limitations of the method. Table 1.4 summarizes these results and the data qualification.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	There were no field quality control samples in this SDG. The field quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
MMW-44A-T01N-GRW	0.75 J	0.005 UJ	---	3320 J	3.4 J
COLUMBINE NO 1-T01N-GRW	---	---	---	1060 J	4.9 J
COLUMBINE NO 2-T01N-GRW	---	---	---	858 J	5.6 J
MMW-10C-T01N-GRW	---	---	---	867 J	5.0 J
MMW-19A-T01N-GRW	---	---	---	1910 J	4.3 J
MMW-24-T01N-GRW	37.4 J	2.6 J	---	2700 J	4.8 J
MMW-27A-T01N-GRW	3.6 J	0.005 UJ	0.035 J	1940 J	4.4 J
MMW-45B-T01N-GRW	0.20 UJ	0.005 UJ	0.048 J	2430 J	4.0 J
MMW-45A-T01N-GRW	0.47 J	0.005 UJ	0.013 J	1430 J	3.9 J
MMW-2-T01N-GRW	0.20 UJ	---	---	2410 J	5.9 J
MMW-36B-T01N-GRW	---	---	---	3920 J	4.5 J
MMW-34B-T01N-GRW	3.5 J	0.005 UJ	---	2680 J	5.1 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Boron (P) DF=10	6.0	3.6	3.7	3.6	4.8	4.691	2.3	MMW-44A-T01N-GRW, MMW-19A-T01N-GRW, MMW-24-T01N-GRW, MMW-45A-T01N-GRW, MMW-34B-T01N-GRW, MMW-34B-D01N-GRW	U CCB, MB-I or U MB-I
Mercury (CV) DF=1				-0.1			0.1	MMW-27A-T01N-GRW, MMW-27A-D01N-GRW, MMW-45B-T01N-GRW, MMW-45B-D01N-GRW, MMW-45A-T01N-GRW, MMW-45A-D01N-GRW, MMW-2-T01N-GRW, MMW-2-D01N-GRW, MMW-36B-T01N-GRW, MMW-36B-D01N-GRW, MMW-34B-T01N-GRW, MMW-34B-D01N-GRW	UJ CCB-L

P=ICP MB = Method Blank CCBx=Continuing Calibration Blank IDL = Instrument Detection Limit

RL=DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
MMW-27A-T01N-GRW					
Total Alkalinity	10.9	NA	75-125%	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery	No qualification
Ammonia an N	66.5	NA		NONE	J MS-L parent
Phosphorus	3.6	NA		NONE	R MS-L parent
Cadmium	175.2	96.4		Parent sample result is nondetect	No qualification
Cobalt	130.8	96.9		Parent sample result is nondetect	No qualification
Copper	131.7	97.7		Parent sample result is nondetect	No qualification
Cyanide	30.6	90.7		NONE	UJ MS-L parent
MMW-27A-D01N-GRW					
Cadmium	68.9	97.1	75-125%	NONE	J MS-L parent
Cobalt	126.3	98.4		Parent sample result is nondetect	No qualification
Copper	128.2	99.5		Parent sample result is nondetect	No qualification
Nickel	43.6	97.4		NONE	J MS-L parent

NA = Not appropriate

Table 1.4
Total vs. Dissolved Qualifications for Inorganics

Sample/Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
MMW-44A-T01N-GRW				
Orthophosphate vs. phosphorus	0.284	0.01	Absolute difference >2x RL (i.e., 0.02)	UJ/J TvP-I for samples MMW-44A-T01N-GRW
MMW-19A-T01N-GRW				
Orthophosphate vs. phosphorus	0.033	0.01	Absolute difference >2x RL (i.e., 0.02)	UJ/J TvP-I for samples MMW-19A-T01N-GRW
MMW-27A-T01N-GRW				
Orthophosphate vs. phosphorus	0.025	0.01	Absolute difference >2x RL (i.e., 0.02)	UJ/J TvP-I for samples MMW-27A-T01N-GRW
Nickel	566	270	Absolute difference >2x RL (i.e., 540)	UJ/J TvP-I for samples MMW-27A-T01N-GRW
MMW-45B-T01N-GRW				
Orthophosphate vs. phosphorus	0.038	0.01	Absolute difference >2x RL (i.e., 0.02)	UJ/J TvP-I for samples MMW-45B-T01N-GRW
MMW-45A-T01N-GRW				
Lead	2.1	1.0	Absolute difference >2x RL (i.e., 2.0)	UJ/J TvP-I for samples MMW-45A-T01N-GRW

Note: The instrument detection limit (IDL), adjusted for dilution, is used as the reporting limit (RL) for total vs. partial evaluations for metals.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT250C

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 02/20/04

Peer Reviewer: Stacey Coker

Date Completed: 02/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
MMW-35B-T01N-GRW	SA	557272	W	X	X
MMW-35B-D01N-GRW	SA	557273	W	X	
MMW-44B-T01N-GRW	SA	557274	W	X	X
MMW-44B-D01N-GRW	SA	557275	W	X	
MMW-19B-T01N-GRW	SA	557276	W	X	X
MMW-19B-D01N-GRW	SA	557277	W	X	
EW-4-T01N-GRW	SA	557278	W	X	X
EW-4-D01N-GRW	SA	557279	W	X	

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative noted that during the cyanide analyses of the samples in this delivery group, several of the quality control standards exhibited percent recoveries in excess of the control criteria. Due to the fact that cyanide was not detected in any of the samples in this data package, no qualification of the data was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	All nitrate, and the majority of nitrite, and orthophosphate results were qualified as estimated, as the analyses were performed several hours beyond the 48-hour holding time. Results for the aforementioned parameters were qualified as estimated (J/UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken ten days after sampling and eight days beyond log-in. The pH for all samples was measured approximately four hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT."
Method Blanks	No	Boron and chromium were detected in several of the continuing calibration blanks resulting in qualification of all of the chromium results and several of the boron results as estimated or nondetect with an indeterminate bias direction. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MMW-35B-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analysis conducted on sample MMW-35B-T01N-GRW was not applicable for five of the 24 metal analytes, as 19 metal analytes exhibited initial concentrations in excess of 50 times the IDL, accounting for dilutions. The percent deviation between the original result and its 5-fold dilution for these analytes was compared to an evaluation criterion of ±10%. As none of the %D for these 19 analytes were in excess of 10%, no data qualification was necessary on the basis of serial dilution. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The molybdenum results for samples EW-4-T01N-GRW and EW-4-D01N-GRW were qualified as estimated (J), with an indeterminate bias direction on the basis of total versus partial disagreement. As both concentrations were greater than 5x the RL, the RPD was compared to an evaluation criteria of ≤30%. As an RPD of 30.6% was calculated for the two molybdenum concentrations, qualification was necessary The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. The internal standard recoveries of ^{6}Li were low for the ICPMS analyses of all samples in this data package. Accordingly, the potassium results for all samples, as verified by the run-logs, were reported from the trace ICP. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	NA	No field QC samples were analyzed with this data package. The field QC results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
MMW-35B-T01N-GRW	0.20 UJ	0.005 UJ	0.010 UJ	2990 J	6.7 J
MMW-44B-T01N-GRW	0.20 UJ	0.008 J	0.010 UJ	2800 J	6.8 J
MMW-19B-T01N-GRW	0.20 UJ	---	---	2530 J	7.0 J
EW-4-T01N-GRW	0.26 J	0.005 UJ	0.033 J	1200 J	7.2 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB 1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Boron (P)	3.5	---	---	---	---	2.3	MMW-19B-D01N-GRW MMW-19B-T01N-GRW MMW-35B-D01N-GRW MMW-35B-T01N-GRW	U CCB-I
Chromium (P)	-1.7	-1.8	---	---	---	1.5	All Samples Qualified	UJ CCB-L

P= ICP CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT251C

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Ansley Watson

Date Completed: 2/23/04

Peer Reviewer: Stacey Coker

Date Completed: 3/1/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	VOCs	Explosives
PR-3-T01N-GRW	SA	557344		W	X	X		
PR-3-D01N-GRW	SA	557345		W	X			
MINE 1-T01N-GRW	SA	557346		W	X	X		
MINE 1-D01N-GRW	SA	557347		W	X			
MMW-43A-T01N-GRW	SA	557348		W	X	X		
MMW-43A-D01N-GRW	SA	557349		W	X			
MMW-31B-T01N-GRW	SA	557350		W	X	X		
MMW-31B-D01N-GRW	SA	557351		W	X			
MMW-18B-T01N-GRW	SA	557352		W	X	X		
MMW-18B-D01N-GRW	SA	557353		W	X			
RB04T-GRW	RB	557354		W	X	X		
RB04D-GRW	RB	557355		W	X			
MMW-30B-T01N-GRW	SA	557356	T01N-GRW or 0BT01NGRW	W	X	X	X	X
MMW-30B-D01N-GRW	SA	557357		W	X			
MMW-30B-T01D-GRW	FD	557358	T01D-GRW or MW30BT01DGRW	W			X	X
RB01T-GRW	RB	557359		W	X	X	X	X
RB01D-GRW	RB	557560		W	X			
FB01T-GRW	FB	557561		W			X	X
TB351-GRW	TB	557562		W			X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FB = Field Blank RB = Rinsate Blank TB = Trip Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The original TDS analyses of sample RB04T-GRW and RB01T-GRW, which were accomplished within holding time, exhibited result that were not consistent with that typical rinsate blank results. Therefore, these samples were reanalyzed 10 days beyond the holding time yielding acceptable results. For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N and nitrite as N. The analysis for pH and conductivity were exceeded by 2 and 10 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Boron, lead, nickel, selenium, and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS MMW-30B-T01N-GRW MMW-30B-D01N-GRW • LD	No	Matrix spike analyses were conducted on the VOC and explosives samples MMW-30B-T01N-GRW and MMW-30B-D01N-GRW. Five matrix spike results were outside acceptance limits for explosives. Table 1.3 summarize these results and the data qualification issued. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution PR-3-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The surrogate recoveries for the explosives analyses were high in samples MMW-30B-T01N-GRW and MMW-30B-T01D-GRW due to the presence of chromatographic peaks that interfered with the surrogate. The recoveries of the surrogate 1,2-dinitrobenzene were 835% and 569%, respectively. These recoveries are above the acceptance range of 87%-114%, suggesting a potential high bias in the associated sample results. All positive results for associated analytes are qualified as estimated ("J SUR-H"), whereas all nondetect samples are considered to be acceptable for use without qualification. The serial dilution analyses were conducted on sample PR-3-T01N-GRW, pH class C, and was applicable for 0 out of 24 metals each. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. Recovery for internal standard Li was high for the ICPMS analysis of samples PR-3-D01N-GRW, MINE 1-T01N/D01N-GRW, MMW-43A-T01N/D01N-GRW, MMW-31B-T01N/D01N-GRW, MMW-18B-T01N/D01N-GRW, RB04T/D-GRW, MMW-30B-T01N/D01N-GRW, and RB01T/D-GRW. Therefore, the potassium results for all samples were reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Y was high for the ICPMS analysis of sample MMW-31B-T01N/D01N-GRW. Therefore, beryllium and molybdenum results for all samples were reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample PR-3-T01N/D01N-GRW the analysis of dissolved zinc, 50.2 µg/L, exceeded that of the total analysis, 28.5 µg/L, beyond variation expected due to the accuracy limitations of the method. Therefore, the results were qualified as estimated (UJ/J TvP-I).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		For samples RB04T/D-GRWand RB01T/D-GRW, the cation/anion balances were outside the acceptance range of ±13% and it was noted that the ratio of the calculated TDS to the measured TDS was also outside the acceptance limit. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary. Similarly, the ratio of calculated TDS to measured TDS was high for these samples. Data qualification was not needed however because the calculated TDS values were considered to be artificially high because the RLs were used in the calculation for nondetects values.
Field QC • Field Duplicate MMW-30B-T01N/T01D-GRW • Rinsate Blank RB04T-GRW RB04D-GRW RB01T-GRW RB01D-GRW • Field Blank FB01T-GRW • Trip Blank TB351-GRW • Other (e.g., splits)	No	There were a few detections in the various rinsate blanks and field blank. These are summarized in Table 1.5. Acetone was detected in the trip blank sample TB351-GRW. Analytes detected in an associated trip blank at concentrations greater than 5 times the equivalent blank concentration will be qualified as nondetect ("U TB-I") in the associated rinsate blank and field blank. The results were qualified as nondetect at the reported concentration. The field quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	No	During the VOC analysis of the samples in this SDG, the associated continuing calibration samples were not within their evaluation criteria. Table 1.4 summarizes the results.
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	No	The nitroaromatics analysis of laboratory control sample LCS yielded a slightly low percent recovery (LCS=62%) of the target compound PYX. The laboratory has not yet established control limits for this compound at this time; therefore the laboratory applied the default range of 70-130%. Since the LCS recoveries are less than the lower limit but >10%, the PYX results for all samples have been qualified as estimated (UJ/J).
Compound Identification	Yes	

Review Parameter	Criteria Met?	Comments
Laboratory-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Quantification	Yes	Due to a malfunction of the software associated with the TOC instrument, it was necessary to calculate the TOC results for the samples analyzed 2/4/04 using an excel spreadsheet, which was provided in the raw data section of the data package. No qualification was considered necessary. In sample MMW-30B-T01N-GRW and MMW-30B-T01D-GRW, the initial analyses of acetone exceeded the calibration range. As such, the samples were analyzed at a dilution. Only the acetone results from the diluted runs were selected for reporting. The data sheets have been marked accordingly.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. Acceptable performance is inferred from ongoing acceptable QC sample results.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	Conductivity (umhos/cm)	pH
PR-3-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	---	425 J	6.7 J
MINE1-T01N-GRW	0.46 J	0.006 J	0.01 UJ	---	2720 J	7.5 J
MMW-43A-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	---	2070 J	7.1 J
MMW-31B-T01N-GRW	0.20 UJ	---	0.01 UJ	---	2790 J	6.6 J
MMW-18B-T01N-GRW	0.63 J	---	0.01 UJ	---	2780 J	6.9 J
RB04T-GRW	---	---	---	18.0 J	5.0 J	6.9 J
MMW-30B-T01N-GRW	---	---	0.024 J	---	2190 J	7.2 J
RB01T-GRW	0.20 UJ	---	0.013 J	10.0 J	0.00 J	7.2 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Boron (P) DF=1			25.7		11.7	MMW-31B-T01N-GRW, MMW-18B-T01N-GRW, MMW-18B-D01N-GRW	U CCB-I
Lead (P) DF=1			-1.6		1.6	MMW-18B-D01N-GRW, RB04T-GRW, RB04D-GRW, MMW-30B-T01N-GRW, MMW-30B-D01N-GRW, RB01T-GRW, RB01D-GRW	UJ/J CCB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Nickel (P) DF=1		-2.6		-2.685	2.4	PR-3-T01N-GRW, PR-3-D01N-GRW, MMW-43A-T01N-GRW, MMW-43A-D01N-GRW, RB04T-GRW, RB04D-GRW, MMW-30B-T01N-GRW, MMW-30B-D01N-GRW, RB01T-GRW, RB01D-GRW	UJ/J CCB, MB-L
Selenium (P) DF=2	-0.3				0.3	PR-3-T01N-GRW, PR-3-D01N-GRW, MINE1-T01N-GRW, MINE1-D01N-GRW MMW-43A-T01N-GRW, MMW-43A-D01N-GRW	UJ/J CCB-L
Sodium (P) DF=10			-3507		490.0	MMW-31B-T01N-GRW, MMW-31B-D01N-GRW, MMW-18B-T01N-GRW, MMW-18B-D01N-GRW, RB04T-GRW, RB04D-GRW, MMW-30B-T01N-GRW, MMW-30B-D01N-GRW RB01T-GRW, RB01D-GRW	UJ/J CCB-L
Analyte				**MB (µg/l)**	**RL (µg/l)**	**Samples Qualified**	**Qualification Code**
2-Butanone				1	10	All VOC samples in the SDG.	U MB-I

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS %R	MSD %R	Criteria	Comment	Action
MMW-30B-T01N-GRW					
HMX	75%	80%	83-122%	Parent and duplicate sample result are nondetect.	UJ MS-L parent and duplicate sample
RDX	68%	75%	81-116%	Parent and duplicate sample result are positive.	J MS-L parent and duplicate sample
2,4,6-trinitrotoluene	110%	110%	75-106%	Parent and duplicate sample result are nondetect.	No qualification
PETN	150%	162%	75-110%	Parent and duplicate sample result are nondetect.	No qualification
PYX	0%	0%	70-130%	Parent and duplicate sample result are nondetect.	R MS-L parent and duplicate sample

NA = Not appropriate

Table 1.4
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
1/20/04 (1157)	Acetone 2-Butanone Trichlorofluoromethane	51.0 30.6 25.5	Results for these analytes in associated samples were qualified as estimated.	J CCAL-I or UJ CCAL-I

Table 1.5
Rinsate Blank Detections

Analytes	RB04T-GRW	RB01T-GRW
Chloride (mg/l)	0.28	---
Ammonia as N (mg/l)	---	0.05
Bicarbonate Alkalinity (mg/l)	2.6	2.8
Total Alkalinity (mg/l)	2.6	2.8
Orthophosphate (mg/l)	0.011	---
TOC (mg/l)	1.2	1.7

--- = Sample was not analyzed for these parameters; therefore no qualification was necessary.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT252A

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 2/17/04

Peer Reviewer: Stacey Coker

Date Completed: 2/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
MMW-31A-T01N-GRW	SA	557414		W	X	X
MMW-31A-D01N-GRW	SA	557415		W	X	
P-3-T01N-GRW	SA	557416		W	X	X
P-3-D01N-GRW	SA	557417		W	X	
DOUGLAS WELL-T01N-GRW	SA	557418	DOUGLASWELL-T01N-GR	W	X	X
DOUGLAS WELL-D01N-GRW	SA	557419	DOUGLASWELL-D01N-G	W	X	
P-1-T01N-GRW	SA	557420		W	X	X
P-1-D01N-GRW	SA	557421		W	X	
MMW-7-T01N-GRW	SA	557422		W	X	X
MMW-7-D01N-GRW	SA	557423		W	X	
MMW-22-T01N-GRW	SA	557424		W	X	X
MMW-22-D01N-GRW	SA	557425		W	X	
P-5B-T01N-GRW	SA	557426		W	X	X
P-5B-D01N-GRW	SA	557427		W	X	
MMW-21-T01N-GRW	SA	557428		W	X	X
MMW-21-D01N-GRW	SA	557429		W	X	
MMW-21-T01D-GRW	FD	557430		W	X	X
MMW-21-D01D-GRW	FD	557431		W	X	
P-5C-T01N-GRW	SA	557432		W	X	X
P-5C-D01N-GRW	SA	557433		W	X	
MMW-30A-T01N-GRW	SA	557434		W	X	X
MMW-30A-D01N-GRW	SA	557435		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The original orthophosphate sample results for this sample delivery group were analyzed within the holding time limits, but yielded calibration check standards concentrations above the calibration range. Therefore, all of the samples were reanalyzed 1 day beyond holding time and yielded acceptable results. For a few samples, the 48-hour holding time was exceeded by less than 48 hours for nitrate as N and nitrite as N. The analysis for pH and conductivity were exceeded by 2 and 10 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Arsenic, boron, and iron were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • L	NA	There were no matrix quality control samples in this SDG. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-21-T01D-GRW MMW-31A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on sample MMW-31A-T01N-GRW and the field duplicate sample MMW-21-T01D-GRW, pH class A. Serial dilution results for sample MMW-21-T01D-GRW and MMW-31A-T01N-GRW were applicable for 1 out of 24 metals each. For both samples, the percent difference between the original result and result for the diluted sample for manganese did not satisfy the ≤10% criterion and the results for this sample were qualified as estimated. Table 1.3 summarizes these results. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. Recovery for internal standard Y was high for the ICPMS analysis of samples P-1-T01N-GRW and MMW-7-T01N/D01N-GRW. Therefore, beryllium and molybdenum results for all samples were reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for internal standard Li was low for the ICPMS analysis of samples MMW-7-T01N/D01N-GRW, MMW-22-T01N/D01N-GRW, P-5B-T01N/D01N-GRW, MMW-21-T01N/D01N-GRW, MMW-21-T01D/D01D-GRW, P-5C-T01N/D01N-GRW, and MMW-30A-T01N/D01N-GRW. Therefore, potassium results for all samples were reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exception of sample DOUGLAS WELL-T01N/D01N-GRW. All percent differences were verified independently. The laboratory case narrative notes that the results compared well with historical results. However, the laboratory suspects the elevated cation reporting limits (potassium and sodium) associated with dilutions for class "A" samples may be the cause of the elevated percent differences. No qualifications were issued on the basis of cation/anion balances, as the results were not an appropriate measure of accuracy.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) MMW-21-T01D/D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	The field duplicate results satisfied the applicable concentration-dependent evaluation criteria and data qualification was not necessary. The field quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
MMW-31A-T01N-GRW	3.3 J	0.005 UJ	0.023 J	1920 J	4.5 J
P-3-T01N-GRW	2.0 J	0.005 UJ	0.01 UJ	1170 J	4.9 J
DOUGLAS WELL-T01N-GRW	0.81 J	0.005 UJ	0.01 UJ	624 J	5.4 J
P-1-T01N-GRW	2.3 J	---	0.01 UJ	1320 J	4.7 J
MMW-7-T01N-GRW	1.4 J	0.005 UJ	15.5 J	6310 J	4.3 J
MMW-22-T01N-GRW	0.20 UJ	---	0.014 J	3440 J	3.5 J
P-5B-T01N-GRW	2.3 J	0.005 UJ	0.0.22 J	1400 J	4.7 J
MMW-21-T01N-GRW	0.76 J	---	0.16 J	3710 J	3.1 J
MMW-21-T01D-GRW	0.57 J	---	0.16 J	3750 J	3.1 J
P-5C-T01N-GRW	2.7 J	---	0.01 UJ	1550 J	4.3 J
MMW-30A-T01N-GRW	2.8 J	---	0.015 J	1710 J	4.7 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples qualified	Qualification Code
Arsenic (P) DF=10					-3.228	2.8	All the samples in this SDG.	UJ/J MB-L
Boron (P) DF=10	5.0	3.1	2.6	4.4		2.3	MMW-31A-T01N-GRW, MMW-31A-D01N-GRW, MMW-7-T01N-GRW, MMW-7-D01N-GRW, MMW-21-T01D-GRW, MMW-21-D01D-GRW	U CCB-I
Iron (P) DF=100			56.5			42.3	P-1-D01N-GRW, P-5B-D01N-GRW MMW-21-T01N-GRW, MMW-21-D01N-GRW	U CCB-I

P=ICP MB = Method Blank CCBx=Continuing Calibration Blank IDL = Instrument Detection Limit

RL=DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
MMW-21-T01N/T01D-GRW			
Manganese	16.5%	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent samples UJ DL-L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT253S

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Ansley Watson

Date Completed: 2/24/04

Peer Reviewer: Stacey Coker

Date Completed: 3/1/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses		
					Metals	Inorganic	BOD/COD
RR-10A1-T01N-SFW	SA	557548		W	X	X	X
RR-10A1-D01N-SFW	SA	557549		W	X		
RR-10-T01N-SFW	SA	557550		W	X	X	X
RR-10-D01N-SFW	SA	557551		W	X		
RR-11A1-T01N-SFW	SA	557552		W	X	X	X
RR-11A1-D01N-SFW	SA	557553		W	X		
RR-11C-T01N-SFW	SA	557554		W	X	X	X
RR-11C-D01N-SFW	SA	557555		W	X		
RR-12-T01N-SFW	SA	557556		W	X	X	X
RR-12-D01N-SFW	SA	557557		W	X		
RR-US-SPRING 13-T01N-SFW	SA	557558	RRUS-SP13-T01N-SFW	W	X	X	X
RR-US-SPRING 13-D01N-SFW	SA	557559	RRUS-SP13-D01N-SFW	W	X		
RR-16-T01N-SFW	SA	557560		W	X	X	X
RR-16-D01N-SFW	SA	557561		W	X		
RR-14-T01N-SFW	SA	557562		W	X	X	X
RR-14-D01N-SFW	SA	557563		W	X		

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

Due to an instrument malfunction the total organic carbon (TOC) analyses were subcontracted to STL-St. Louis. However, STL-St. Louis also experienced instrument problems. As such, the analyses were subsequently performed 6 days beyond the prescribed analytical holding time. Table 1.1 summarizes the holding time qualifications. The data package provided by STL St. Louis was included at the end of the STL-Burlington submittal.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 10 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Copper, iron, and molybdenum were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RR-US-SPRING 13-T01N-SFW RR-US-SPRING 13-D01N-SFW • LD	No	Matrix spike analyses were conducted on the volatile organic compound samples RR-US-SPRING 13-T01N-SFW and RR-US-SPRING 13-D01N-SFW. All of the matrix spike results were within acceptance limits; therefore no qualification was necessary. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-US-SPRING 13-T01N-SFW RR-US-SPRING 13-D01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the matrix spike samples for RR-US-SPRING 13-T01N-SFW and RR-US-SPRING 13-D01N-SFW, pH class C. Serial dilution results for sample RR-US-SPRING 13-T01N-SFW was applicable for 20 out of 24 metals and sample RR-US-SPRING 13-D01N-SFW was applicable for 19 out of 24 metals. For both samples, the percent difference between the original result and result for the diluted sample for selenium not satisfy the ≤10% criterion and the results for this sample were qualified as estimated. Table 1.3 summarizes these results. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. Recovery for internal standard Li was high for the ICPMS analysis of all the samples in this SDG. Therefore, results for all samples were reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The ratios of the calculated versus measured TDS for all samples were within 0.5 and 1.5 except for sample RR-12-T01N/D01N-SFW. Calculating the TDS independently yielded values for the ratio that were less than 1.5; therefore no qualification was necessary.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	There were no field quality control results is this SDG. The field quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	NA	
Laboratory-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	No	As noted in the laboratory case narrative, during the chloride analysis of 1/15/04, the continuing calibration check standards (CCB1=0.230 and CCB2=0.269) yielded concentrations that marginally exceeded the reporting limit (RL=0.2). Only the samples with chloride concentrations greater than ten times those obtained in the blanks were formally reported from this analytical sequence; therefore no qualification was necessary. As noted in the laboratory case narrative, the calibration check standard CCV#2 (01/20/04) yielded an alkalinity recovery slightly in excess of the control criteria of 90-110%. As the true value for the standard was 100 ppm, the extended data package verified an elevated recovery of 114.4% for this calibration check standard. As all alkalinity results were associated with this calibration event, all positive results for bicarbonate and total alkalinity results in this data package were qualified as estimated (J) with a high bias direction assigned.
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TOC (mg/L)	Conductivity (umhos/cm)	pH
RR-10A1-T01N-SFW	0.66 J	---	0.01 UJ	1.0 UJ	285 J	7.3 J
RR-10-T01N-SFW	0.73 J	---	0.0.11 J	0.43 J	311 J	7.5 J
RR-11A1-T01N-SFW	0.64 J	---	0.01 UJ	0.40 J	292 J	7.5 J
RR-11C-T01N-SFW	0.64 J	0.011 J	0.01 J	1.0 UJ	356 J	7.2 J
RR-12-T01N-SFW	0.65 J	0.008 J	0.01 UJ	1.0 UJ	361 J	7.4 J
RR-US-SPRING 13-T01N-SFW	0.64 J	0.009 J	0.017 J	1.0 UJ	345 J	7.3 J
RR-16-T01N-SFW	0.64 J	0.012 J	0.01 UJ	1.0 UJ	357 J	7.4 J
RR-14-T01N-SFW	0.65 J	0.011 J	0.01 UJ	1.0 UJ	361 J	7.3 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Copper (MS) DF=1			0.505	0.5	RR-12-D01N-SFW	U MB-I
Iron (P) DF=1		164.9		42.3	RR-16-T01N-SFW, RR-16-D01N-SFW, RR-14-T01N-SFW, RR-14-D01N-SFW	U CCB-I
Molybdenum (MS) DF=1	0.8		0.414	0.3	RR-10A1-T01N-SFW, RR-10A1-D01N-SFW, RR-10-T01N-SFW, RR-10-D01N-SFW, RR-11A1-T01N-SFW, RR-11A1-D01N-SFW, RR-11C-T01N-SFW, RR-11C-D01N-SFW,	U CCB, MB-I or U CCB-I

P=ICP MB = Method Blank CCBx=Continuing Calibration Blank IDL = Instrument Detection Limit

RL=DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
RR-US-SPRING 13-T01N-SFW			
Selenium	21.7%	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample J DL-L
RR-US-SPRING 13-D01N-SFW			
Selenium	14.6 %	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample J DL-L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT254S

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 2/25/04

Peer Reviewer: Stacey Coker

Date Completed: 3/1/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses		
					Metals	Inorganic	BOD/COD
RR-US-SPRING 39-T01N-SFW	SA	557564	RR-US-SPNG39-T01N-SFW or RR-US-SPNG39-T01N-SF	W	X	X	X
RR-US-SPRING 39-D01N-SFW	SA	557565	RR-US-SPNG39-D01N-SFW or RR-US-SPNG39-D01N-SF	W	X		
RR-DS-SPRING 13-T01N-SFW	SA	557566	RR-DS-SPNG13-T01N-SFW or RR-DS-SPNG13-T01N-SF	W	X	X	X
RR-DS-SPRING 13-D01N-SFW	SA	557567	RR-DS-SPNG13-D01N-SFW or RR-DS-SPNG13-D01N-SF	W	X		
RR-DS-SPRING 13-T01D-SFW	SA	557568	RR-DS-SPNG13-T01D-SFW or RR-DS-SPNG13-T01D-SF	W	X	X	X
RR-DS-SPRING 13-D01D-SFW	SA	557569	RR-DS-SPNG13-D01D-SFW or RR-DS-SPNG13-D01D-SF	W	X		
RR-13-T01N-SFW	SA	557570		W	X	X	X
RR-13-D01N-SFW	SA	557571		W	X		
RR-7-T01N-SFW	SA	557572		W	X	X	X
RR-7-D01N-SFW	SA	557573		W	X		
RB01T-SFW	RB	557574		W	X	X	X
RB01D-SFW	RB	557575		W	X		
RR-DS-SPRING 39-T01N-SFW	SA	557576	RR-DS-SPNG39-T01N-SFW or RR-DS-SPNG39-T01N-SF	W	X	X	X
RR-DS-SPRING 39-D01N-SFW	SA	557577	RR-DS-SPNG39-D01N-SFW or RR-DS-SPNG39-D01N-SF	W	X		

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

Due to an instrument malfunction the total organic carbon (TOC) analyses were subcontracted to STL-St. Louis. However, STL-St. Louis also experienced instrument problems. As such, the analyses were subsequently performed 6 days beyond the prescribed analytical holding time. Table 1.1 summarizes the holding time qualifications. The data package provided by STL St. Louis was included at the end of the STL-Burlington submittal.

During the chloride analysis of 1/15/04, the continuing calibration blanks yielded concentrations (CCB1=0.230 mg/L and CCB2=0.269 mg/L) that marginally exceeded the reporting limit of RL=0.2m/L. All detected chloride concentrations were greater than five times those obtained in the calibration blanks and therefore were reported by the laboratory. No qualification was necessary because all sample concentrations were greater than 5 times the CCB concentrations.

The alkalinity calibration check standard CCV#2 (01/20/04) yielded a recovery slightly in excess of the control criteria of 90-110%. The extended data package verified an elevated recovery of 114.4% for this calibration check standard. As all alkalinity results were associated with this calibration event, all positive results for bicarbonate and total alkalinity results in this data package were qualified as estimated (J) with a high bias direction assigned.

The orthophosphate analysis of the initial calibration blank from the 1/15/04 analysis yielded a negative concentration value, ICB=-0.0307 mg/L, for which the absolute value was greater than the reporting limit of RL=0.01 mg/L. Therefore, the reporting limit for the samples associated with this blank was elevated to 0.05 mg/l, which meets the QAPP reporting limit requirement such that the change did not affect the usability of the data. No qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The bottle labeled for the cyanide analysis of sample RR-DS-SPRING 13-T01D-SFW was incorrectly labeled RR-DS-SPRING 13-T01N-SFW. The laboratory hand corrected the error and logged the sample in appropriately.
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 8 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Beryllium, molybdenum, potassium, and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-US-SPRING 39-T01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the matrix spike sample for RR-US-SPRING 39-T01N-SFW, pH class C, and was applicable for 1 out of 24 metals. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. Recovery for internal standard Li was high for the ICPMS analysis of samples RR-US-SPRING 39-T01N/D01N-SFW, RR-DS-SPRING 13-T01N/D01N-SFW, RR-DS-SPRING 13-T01D/D01D-SFW, RR-13-

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		T01N/D01N-SFW, RR-7-T01N/D01N-SFW, RB01D-SFW, RR-DS-SPRING 39-T01N/D01N-SFW. Therefore, potassium results for all samples were reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample RB01T/D-SFW, the cation/anion balances was outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary.
Field QC • Field Duplicate (FD) RR-DS-SPRING 13-T01D-SFW RR-DS-SPRING 13-D01D-SFW • Rinsate Blank (RB) RB01T-SFW RB01D-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	The field duplicate results satisfied the applicable concentration-dependent evaluation criteria and data qualification was not necessary. There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.3. The field quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TOC (mg/L)	Conductivity (umhos/cm)	pH
RR-US-SPRING 39-T01N-SFW	0.61 J	---	0.05 UJ	1.0 UJ	297 J	7.4 J
RR-DS-SPRING 13-T01N-SFW	0.64 J	0.01 J	0.05 UJ	1.0 UJ	349 J	7.3 J
RR-DS-SPRING 13-T01D-SFW	0.64 J	0.011 J	0.05 UJ	1.0 UJ	345 J	7.5 J
RR-13-T01N-SFW	0.65 J	0.01 J	0.05 UJ	1.0 UJ	348 J	7.5 J
RR-7-T01N-SFW	0.69 J	---	---	1.0 UJ	294 J	7.7 J
RB01T-SFW	0.20 UJ	---	0.05 UJ	1.0 UJ	0.59 J	7.6 J
RR-DS-SPRING 39-T01N-SFW	0.64 J	---	0.05 UJ	0.5 J	341 J	6.9 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=1	2.9	2.3	1.512	1.0	RR-US-SPRING 39-T01N-SFW, RR-US-SPRING 39-D01N-SFW, RR-DS-SPRING 13-T01N-SFW, RR-13-T01N-SFW, RR-13-D01N-SFW, RR-7-T01N-SFW, RR-7-D01N-SFW, RB01T-SFW, RB01D-SFW, RR-DS-SPRING 39-D01N-SFW	U CCB, MB-I
Molybdenum (MS) DF=1	0.5			0.3	RR-US-SPRING 39-D01N-SFW	U CCB-I
Potassium (P) DF=1	-3135	-1747	-1518	1099	All samples in this SDG.	UJ/J CCB, MB-L
Sodium (P) DF=1			1176	920.1	RR-US-SPRING 39-T01N-SFW, RR-US-SPRING 39-D01N-SFW, RR-DS-SPRING 13-T01D-SFW, RR-DS-SPRING 13-D01D-SFW, RR-13-T01N-SFW, RR-13-D01N-SFW, RR-7-D01N-SFW, RR-DS-SPRING 39-T01N-SFW, RR-DS-SPRING 39-D01N-SFW	U MB-I

P=ICP MB = Method Blank CCBx=Continuing Calibration Blank IDL = Instrument Detection Limit

RL=DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Rinsate Blank Detections

Analytes	RB01T-SFW
TDS (mg/l)	20.0
TSS (mg/l)	0.5
Bicarbonate Alkalinity (mg/l)	2.9
Total Alkalinity (mg/l)	2.9
COD (mg/l)	23.8

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT255C

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 2/26/04

Peer Reviewer: Stacey Coker

Date Completed: 3/1/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
SUMP5000-T01N-GRW	SA	557595		W	X	X
SUMP5000-D01N-GRW	SA	557596		W	X	
MMW-10B-T01N-GRW	SA	557597		W	X	X
MMW-10B-D01N-GRW	SA	557598		W	X	
MMW-29A-T01N-GRW	SA	557599		W	X	X
MMW-29A-D01N-GRW	SA	557600		W	X	
MMW-29B-T01N-GRW	SA	557601		W	X	X
MMW-29B-D01N-GRW	SA	557602		W	X	
MMW-28A-T01N-GRW	SA	557603		W	X	X
MMW-28A-D01N-GRW	SA	557604		W	X	
COLUMBINE CANYON-T01N-GRW	SA	557605	COLUMCAN-T01N-GRW	W	X	X
COLUMBINE CANYON -D01N-GRW	SA	557606	COLUMCAN-D01N-GRW	W	X	
RB09T-GRW	RB	557607		W	X	X
RB09D-GRW	RB	557608		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FB = Field Blank RB = Rinsate Blank TB = Trip Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

Due to an instrument malfunction the total organic carbon (TOC) analyses were subcontracted to STL-St. Louis. However, STL-St. Louis also experienced instrument problems. As such, the analyses were subsequently performed 6 days beyond the prescribed analytical holding time. Table 1.1 summarizes the

holding time qualifications. The data package provided by STL St. Louis was included at the end of the STL-Burlington submittal.

During the chloride analysis of 1/15/04, the continuing calibration check standards yielded concentrations (CCB1=0.230 mg/L and CCB2=0.269 mg/L) that marginally exceeded the reporting limit of 0.2 mg/L. Only the samples with chloride concentrations greater than ten times those obtained in the blanks were reported from this analytical sequence; therefore no qualification was necessary.

The alkalinity calibration check standard CCV#2 (01/20/04) yielded a recovery slightly in excess of the control criteria of 90-110%. The reviewer used the extended data package to verify an elevated recovery of 114.4% for this calibration check standard. As all alkalinity results were associated with this calibration event, all positive results for bicarbonate and total alkalinity results in this data package were qualified as estimated (J) with a high bias direction assigned.

The orthophosphate analysis of the initial calibration blank from the 1/15/04 analysis yielded a negative concentration value, ICB=-0.0280 mg/L, for which the absolute value was greater than the reporting limit of 0.01 mg/L. Therefore, the reporting limit for the samples associated with this blank was elevated to 0.05 mg/L, which meets the QAPP reporting limit requirement such that the change did not affect the usability of the data. No qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The original TDS analysis of sample RB09T-GRW exhibited a result that was not consistent with a characteristic rinsate blank sample. This sample was re-analyzed 9 days beyond the holding time, yielding acceptable results. The results from the reanalysis were presented. For a few samples, the 48-hour holding time was exceeded by less than 48 hours for nitrate as N and nitrite as N. The analysis for pH and conductivity were exceeded by 2 and 10 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Beryllium, cadmium, copper, mercury, selenium, and chloride were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS COLUMBINE CANYON-T01N-GRW COLUMBINE CANYON-D01N-GRW • LD	No	Matrix spike analyses were conducted on samples COLUMBINE CANYON-T01N-GRW and COLUMBINE CANYON-D01N-GRW. All of the matrix spike results were within acceptance limits. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution COLUMBINE CANYON-T01N-GRW COLUMBINE CANYON-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on sample COLUMBINE CANYON-T01N-GRW and COLUMBINE CANYON-D01N-GRW, pH class C. Serial dilution results for sample COLUMBINE CANYON-T01N-GRW was applicable for 16 out of 24 metals and sample COLUMBINE CANYON-D01N-GRW was applicable for 15 out of 24 metals. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Li was high for the ICPMS analysis of all the samples in this SDG. Therefore, potassium results for all samples were reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		Recovery for internal standard Y was high for the ICPMS analysis of samples SUMP5000-T01N-GRW, MMW-10B-T01N/D01N-GRW, and MMW-29A-T01N/D01N-GRW. Therefore, beryllium and molybdenum results for these samples were reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample MMW-29A-T01N/D01N-GRW the analysis of dissolved selenium, 6.4µg/L, exceeded that of the total analysis, 4.7 µg/L, beyond variation expected due to the accuracy limitations of the method. Therefore, the results were qualified as estimated (UJ/J TvP-I). For sample RB09T/D-GRW, the cation/anion balances was outside the acceptance range of ±13%, and it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) RB09T-GRW RB09D-GRW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were a few detections in the rinsate blank (RB). These are summarized in Table 1.3. The field quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TDS (mg/L)	TOC (mg/L)	Conductivity (umhos/cm)	pH
SUMP5000-T01N-GRW	2.5 J	0.005 UJ	0.01 UJ	---	1.0 UJ	1780 J	8.1 J
MMW-10B-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	---	1.0 UJ	2460 J	6.3 J
MMW-29A-T01N-GRW	3.1 J	0.005 UJ	0.01 UJ	---	1.0 UJ	1390 J	5.0 J
MMW-29B-T01N-GRW	0.2 UJ	0.005 UJ	0.01 UJ	---	1.0 UJ	1010 J	7.2 J
MMW-28A-T01N-GRW	0.66 J	0.005 UJ	0.01 UJ	---	1.0 UJ	769 J	6.4 J
COLUMBINE CAYON-T01N-GRW	0.4 J	---	---	---	1.0 UJ	164 J	7.3 J
RB09T-GRW	0.25 J	0.005 UJ	0.01 UJ	14 J	1.0 UJ	1.2 J	7.2 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=1	1.0					1.0	MMW-29B-T01N-GRW	U CCB-I
Cadmium (P) DF=1		-0.8	-1.1	-0.8	-1.186	0.7	MMW-29B-T01N-GRW, MMW-29B-D01N-GRW, MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, COLUMBINE CANYON-T01N-GRW, COLUMBINE CANYON-D01N-GRW, RB09T-GRW, RB09D-GRW	UJ/J CCB, MB-L
Copper (P) DF=1		-3.9	-3.6	-4.0		3.5	SUMP5000-D01N-GRW, MMW-29B-T01N-GRW, MMW-29B-D01N-GRW, MMW-28A-T01N-GRW, MMW-28A-D01N-GRW, COLUMBINE CANYON-T01N-GRW, COLUMBINE CANYON-D01N-GRW, RB09T-GRW, RB09D-GRW	UJ/J CCB-L
Mercury (CV) DF=1	-0.1		-0.1	-0.1		0.1	All the samples in this SDG.	UJ/J CCB-L
Selenium (MS) DF=2 1/26/04		-0.3			-0.688	0.3	SUMP5000-D01N-GRW, MMW-29A-T01N-GRW, MMW-29B-T01N-GRW, MMW-29B-D01N-GRW, MMW-28A-T01N-GRW, MMW-28A-D01N-GRW	UJ/J CCB, MB-L
Selenium (MS) DF=2 1/28/04		-0.3				0.3	COLUMBINE CANYON-T01N-GRW, COLUMBINE CANYON-D01N-GRW, RB09T-GRW, RB09D-GRW	UJ/J CCB-L
Analyte					MB (mg/l)	RL (mg/l)	Samples Qualified	Qualification Code
Chloride					0.2	0.2	COLUMBINE CANYON-T01N-GRW	U MB-I

P=ICP MB = Method Blank CCBx=Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Rinsate Blank Detections

Analytes	RB09T-GRW
Ammonia as N (mg/l)	0.056
Bicarbonate Alkalinity (mg/l)	3.6
Total Alkalinity (mg/l)	3.6
Manganese (µg/L)	27.0

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT256A

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 2/27/04

Peer Reviewer: Stacey Coker

Date Completed: 3/1/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
LOWER SPRING 13-T01N-GRW	SA	557648	LOWERSPRNG13-T01N-GRW and LOWERSPRNG13-T01N-G	W	X	X
LOWER SPRING 13-D01N-GRW	SA	557649	LOWERSPRNG13-D01N-GRW and LOWERSPRNG13-D01N-G	W	X	
SPRING 13-T01N-GRW	SA	557650		W	X	X
SPRING 13-D01N-GRW	SA	557651		W	X	
MMW-28B-T01N-GRW	SA	557652		W	X	X
MMW-28B-D01N-GRW	SA	557653		W	X	
P-4B-T01N-GRW	SA	557654		W	X	X
P-4B-D01N-GRW	SA	557655		W	X	
P-2-T01N-GRW	SA	557656		W	X	X
P-2-D01N-GRW	SA	557657		W	X	
SPRING 39 PUMP-T01N-GRW	SA	557658	SPRING39PUMP-T01N-GR	W	X	X
SPRING 39 PUMP-D01N-GRW	SA	557659	SPRING39PUMP-D01N-G	W	X	
SPRING 13 PUMP-T01N-GRW	SA	557660	SPRING13PUMP-T01N-GR	W	X	X
SPRING 13 PUMP-D01N-GRW	SA	557661	SPRING13PUMP-D01N-G	W	X	
GWW-2-T01N-GRW	SA	557662		W	X	X
GWW-2-D01N-GRW	SA	557663		W	X	
MMW-33A-T01N-GRW	SA	557664		W	X	X
MMW-33A-D01N-GRW	SA	557665		W	X	
GWW-1-T01N-GRW	SA	557666		W	X	X
GWW-1-D01N-GRW	SA	557667		W	X	
MMW-49A-T01N-GRW	SA	557668		W	X	X
MMW-49A-D01N-GRW	SA	557669		W	X	
MMW-10A-T01N-GRW	SA	557670		W	X	X
MMW-10A-D01N-GRW	SA	557671		W	X	
GWW-3-T01N-GRW	SA	557672		W	X	X
GWW-3-D01N-GRW	SA	557673		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FB = Field Blank RB = Rinsate Blank TB = Trip Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

Due to an instrument malfunction the total organic carbon (TOC) analyses were subcontracted to STL-St. Louis. However, STL-St.Louis also experienced instrument problems. As such, the analyses were subsequently performed 6 days beyond the prescribed analytical holding time. Table 1.1 summarizes the holding time qualifications. The data package provided by STL St. Louis was included at the end of the STL-Burlington submittal.

During the chloride analysis on 1/15/04, the continuing calibration check standards (CCBs) yielded concentrations (CCB1=0.230 mg/L and CCB2=0.269 mg/L) that marginally exceeded the reporting limit of 0.2 mg/L. Only the samples with chloride concentrations greater than ten times those obtained in the blanks were reported from this analytical sequence; therefore no qualification was necessary. The case narrative also noted that the CCBs from 1/22/04 yielded concentrations that exceeded the reporting limit. However, upon further review, this statement was not verified from the raw data, as all the CCB concentration from the 1/22/04 sequence were less than the reporting limit. No qualification was necessary.

The case narrative noted that the orthophosphate analysis of the initial calibration blank from the 1/15/04 analysis yielded a negative concentration for which the absolute value of the result was greater than the reporting limit. However, upon further review this statement was not verified and was considered to be erroneously carried over from another SDG. No qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	For sample SPRING 13-T01N/D01N-GRW, the collection date listed on the COC was 1/14/04. However, the labels for this sample were labeled as 1/13/04. The laboratory used the date from the labels to log the sample in for analysis.
Holding Times	No	For a few samples, the 48-hour holding time was exceeded by less than 48 hours for nitrate as N and nitrite as N. The analysis for pH and conductivity were exceeded by 2 and 10 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Chromium and mercury were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS GWW-3-T01N-GRW GWW-3-D01N-GRW • LD	No	Matrix spike analyses were conducted on samples GWW-3-T01N-GRW and GWW-3-D01N-GRW. Nine matrix spike results were outside acceptance limits. Tables 1.3 summarize these results and the data qualification issued. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution GWW-3-T01N-GRW GWW-3-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on sample GWW-3-T01N-GRW and GWW-3-D01N-GRW, pH class A. Serial dilution results for both samples were applicable for 0 out of 24 metals. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples LOWERSPRING 13-T01N/D01N-GRW, SPRING 13-T01N-GRW, P-4B-T01N/D01N-GRW, and MMW-10A-T01N/D01N-GRW. Therefore, beryllium

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		and molybdenum results for all samples were reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. For sample MMW-49A-T01N/D01N-GRW the analysis of dissolved zinc, 5700 µg/L, exceeded that of the total analysis, 4360 µg/L, beyond variation expected due to the accuracy limitations of the method. Therefore, the results were qualified as estimated (UJ/J TvP-I).
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	There were no field quality control samples in this SDG. The field quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TOC (mg/L)	Conductivity (umhos/cm)	pH
LOWER SPRING 13-T01N-GRW	0.2 UJ	0.005 UJ	0.016 J	0.4 J	2040 J	4.1 J
SPRING 13-T01N-GRW	---	---	---	1.0 UJ	2080 J	4.0 J
MMW-28B-T01N-GRW	0.58 J	0.005 UJ	0.011 J	1.0 UJ	900 J	4.7 J
P-4B-T01N-GRW	2.1 J	---	---	1.0 UJ	1400 J	4.8 J
P-2-T01N-GRW	2.0 J	---	---	1.0 UJ	1310 J	4.8 J
SPRING 39 PUMP-T01N-GRW	1.8 J	0.005 UJ	0.01 UJ	1.0 UJ	1720 J	4.9 J
SPRING 13 PUMP-T01N-GRW	0.28 J	0.013 J	0.01 UJ	1.0 UJ	1840 J	3.8 J
GWW-2-T01N-GRW	2.5 J	0.005 UJ	0.026 J	1.0 UJ	1890 J	4.1 J
MMW-33A-T01N-GRW	2.4 J	0.005 UJ	0.017 J	1.0 UJ	1580 J	4.5 J
GWW-1-T01N-GRW	3.2 J	0.005 UJ	0.023 J	1.0 UJ	1540 J	4.8 J
MMW-49A-T01N-GRW	2.5 J	0.005 UJ	0.05 UJ	1.0 UJ	1440 J	4.5 J
MMW-10A-T01N-GRW	4.7 J	0.005 UJ	0.05 UJ	1.0 UJ	2260 J	4.5 J
GWW-3-T01N-GRW	2.7 J	0.005 UJ	0.05 UJ	1.0 UJ	1810 J	4.5 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Chromium (P) DF=100				1.1	1.340 1.157	1.1	GWW-2-D01N-GRW, MMW-33A-T01N-GRW, GWW-1-T01N-GRW, GWW-1-D01N-GRW, MMW-49A-D01N-GRW, MMW-10A-D01N-GRW, GWW-3-D01N-GRW	U MB-I or U CCB, MB-I
Mercury (CV) DF=1			-0.1	-0.1		0.1	LOWERSPRING 13-T01N-GRW, LOWERSPRING 13-D01N-GRW, SPRING 123-T01N-GRW, SPRING 13-D01N-GRW, MMW-28B-T01N-GRW, MMW-28B-D01N-GRW, P-4B-T01N-GRW, P-4B-D01N-GRW, P-2-T01N-GRW, P-2-D01N-GRW, SPRING 39 PUMP-T01N-GRW, SPRING 39 PUMP-D01N-GRW, SPRING 13 PUMP-T01N-GRW, SPRING 13 PUMP-D01N-GRW	UJ/J CCB-L

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
Chloride	334	NA	75-125%	No qualification issued because sample result was on the threshold of a "not applicable" condition. If the sample result is rounded it is exactly 4x the spike level. As such, the high MS% R was not considered representative of the accuracy of the analysis on the site-specific sample matrix.	No qualification
Nitrate as N	573.3	NA		Parent sample result is positive.	J MS-H parent
Orthophosphate	71.8	NA		Parent sample result is nondetect.	UJ MS-L
Cadmium	19.0	105.5		Parent sample result is positive.	J MS-L parent
Selenium	72.0	94.8		Parent sample result is positive.	J MS-L parent
Cyanide	18.3	102.0		Parent sample result is nondetect.	R MS-L parent
GWW-3-D01N-GRW					
Arsenic	77.8	113.0	75-125%	Parent sample result is nondetect.	UJ MS-L parent
Cadmium	66.3	100.0		Parent sample result is positive.	J MS-L parent
Copper	60.9	101.7		Parent sample result is positive.	J MS-L parent

NA = Not appropriate

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT257C

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes, SVOC and TPH methods only

Data Reviewer: Ansley Watson

Date Completed: 2/27/04

Peer Reviewer: Stacey Coker

Date Completed: 3/5/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Metals	Inorganics	VOCs	SVOCs (PAHs)	TPH
FB02T-GRW	FB	557768		W			X		
MMW-25B-T01N-GRW	SA	557769		W	X	X			
MMW-25B-D01N-GRW	SA	557770		W	X				
RB05T-GRW	SA	557771		W	X	X			
RB05D-GRW	SA	557772		W	X				
MMW-40A-T01N-GRW	SA	557773		W	X	X			
MMW-40A-D01N-GRW	SA	557774		W	X				
RANGER STATION-T01N-GRW	SA	557775	RANGERSTN-T01N-GRW	W	X	X			
RANGER STATION-D01N-GRW	SA	557776	RANGERSTN-D01N-GRW	W	X				
SC-3B-T01N-GRW	SA	557777		W	X	X			
SC-3B-D01N-GRW	SA	557778		W	X				
FB02T-GRW	FB	557779		W			X[3]	X[3]	X[3]
TB352-GRW	TB	557780		W	X		X		
RB02T-GRW[4]	RB	557781		W	X	X	X		
RB02D-GRW	RB	557782		W	X				
RB03T-GRW	RB	557783		W	X	X			
RB03D-GRW	RB	557784		W	X				
RB02T-GRW[4] (organics only)	RB	557785		W				X[3]	X[3]

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FB = Field Blank RB = Rinsate Blank TB = Trip Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

[3]These field QC samples are associated with sample MMW-48A-T01N-GRW, which was reported in WAT258A.

[4]These are the same rinsate blank, but the laboratory chose to log the organic analysis in under a different lab ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

These organic analyses were not required as part of the RI/FS QAPP and were conducted at the request of the client. The VOCs were analyzed by EPA method 8260, the SVOCs were analyzed by EPA method 8270 in the selective ion monitoring (SIM) mode, and TPH was analyzed by EPA method 8015M.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

Due to an instrument malfunction the total organic carbon (TOC) analyses were subcontracted to STL-St. Louis. However, STL-St. Louis also experienced instrument problems. As such, the analyses were subsequently performed 6 days beyond the prescribed analytical holding time. Table 1.1 summarizes the holding time qualifications. The data package provided by STL St. Louis was included at the end of the STL-Burlington submittal.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48-hour holding time was exceeded by less than 48 hours for nitrate as N and nitrite as N. The analysis for pH and conductivity were exceeded by 2 and 16 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony and iron were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	No	There were no matrix spike quality control samples in this SDG. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-25B-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on sample MMW-25B-T01N-GRW, pH class C. Serial dilution result was applicable for 1 out of 24 metals. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of sample SC-3B-T01N/D01N-GRW. Therefore, beryllium and molybdenum results for all samples were reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. Recovery for SVOC internal standard benzo (a) pyrene-d12 was high for sample RB02T-GRW. The sample was reanalyzed yielding similar results, however, this result was selected because the internal standard exceedance was lower. Therefore, the analyte associated with benzo (a) pyrene-d12 was qualified as estimated (UJ/J) in both the original and the reanalyzed sample. For sample RB05T/D-GRW, RB02T/D-GRW, and RB03T/D-GRW, the cation/anion balances was outside the acceptance range of ±13%, and it was noted that the ratio of the calculated TDS to the measured TDS was outside the acceptance limit. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate • Rinsate Blank RB09T-GRW RB09D-GRW • Field Blank FB02T-GRW • Trip Blank (TB) TB352-GRW • Other (e.g., splits)	No	There were a few detections in the various rinsate blanks (RB) and field blank (FB). The detections are summarized in Table 1.3. The field quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	The labels for the SVOC initial calibrations standards were incorrectly marked on the quantitation report in the raw data. The raw data pages were hand corrected to properly identify each standard. No qualification was considered necessary.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	See below.
Laboratory-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	No	The VOC continuing calibration results for which the drift in analyte response exceeded 25% and resulting data qualifications are summarized in Table 1.4.
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	No	The volatile organic compounds (VOC) analysis of laboratory control samples NXID LCS and LCSD yielded a slightly low percent recoveries of the target compounds vinyl acetate, 1,2,4-trichlorobenzene, 1,2,3-trichlorobenzene, and tert-butylbenzene. Furthermore, NXID LCS and LCSD yielded slightly high percent recoveries of the target compounds dichlorofluoromethane, chloromethane, vinyl chloride, bromomethane, trichlorofluoromethane, trichloroethene, tetrachloroethene, and 1,1,2,2-tetrachloroethene. Table 1.5 summarizes the LCS and LCSD qualifications.
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Yes	

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	TOC (mg/L)	Conductivity (umhos/cm)	pH
MMW-25B-T01N-GRW	0.32 J	0.005 UJ	0.85 J	2070 J	7.0 J
RB05T-GRW	0.02 UJ	0.005 UJ	1.0 UJ	0.00 J	7.0 J
MMW-40A-T01N-GRW	2.0 J	0.005 UJ	1.0 UJ	885 J	6.5 J
RANGER STATION-T01N-GRW	0.43 J	0.005 UJ	0.63 J	356 J	6.5 J
SC-3B-T01N-GRW	0.20 UJ	---	1.1 J	2330 J	5.9 J
RB02T-GRW	0.20 UJ	---	1.0 UJ	0.02 J	6.2 J
RB03T-GRW	0.20 UJ	0.005 UJ	1.0 UJ	0.00 J	6.1 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS) DF=2	0.9	0.9	0.9			1.7		All samples in this SDG	U CCB, MB-I
Iron (P) DF=10				46.2	56.3		42.3	RANGER STATION-D01N-GRW	U CCB-I

P=ICP MB = Method Blank CCBx=Continuing Calibration Blank IDL = Instrument Detection Limit RL= Reporting Limit

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Field QC Blank Detections

Analytes	RB05T-GRW	RB02T-GRW	RB03T-GRW	FB02T-GRW
TSS (mg/l)	0.70	0.70	---	NA
Chloride (mg/l)	0.24	0.32	---	NA
Bicarbonate Alkalinity (mg/l)	2.9	2.8	2.5	NA
Total Alkalinity (mg/l)	2.9	2.8	2.5	NA
Ammonia (mg/l)	0.047	---	0.007	NA
Phosphorous (mg/l)	0.011	---	---	NA
Chloroform (µg/l)	---	0.29	---	0.77

NA = Not applicable

Table 1.4
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
1/19/04 (2107)	Dichlorodifluoromethane Cis-1, 4-dichloro-2-butene 1,2,4-trichlorobenzene Naphthalene 1,2,3-trichlorobenzene	36.2% 36.8% 31.6% 39.1% 26.8%	Results for these analytes in associated samples were qualified as estimated.	UJ/J CCAL-I

Table 1.5
LCS and LCSD Results and Parent Sample Qualifications

Analyte	LCS%R	LCSD %R	Criteria	Comment	Action
(VOC) NXID					
Dichlorofluoromethane	**130%**	**120%**	78-116%	All VOC samples are nondetect for these analytes.	No qualification
Chloromethane	**130%**	110%	68-118%		No qualification
Vinyl chloride	**130%**	**120%**	78-118%		No qualification
Bromomethane	**130%**	**120%**	72-118%		No qualification
Trichlorofluoromethane	**120%**	110%	67-111%		No qualification
Vinyl acetate	**54%**	**49%**	60-140%		UJ LCS-L
Trichloroethene	**110%**	**110%**	70-109%		No qualification
Tetrachloroethene	**120%**	140%	71-107%		No qualification
1,1,2,2-Tetrachloroethene	**110%**	**110%**	74-108%		No qualification
1,2,4-trichlorobenzene	**75%**	**77%**	81-135%		UJ LCS-L
Tert-butylbenzene	87%	**79%**	80-124%		UJ LCS-L
1,2,3-trichlorobenzene	**79%**	83%	81-137%		UJ LCS-L

Bolded % Rs = The analytes outside of LCS/LCSD recovery limits.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT258A

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water X Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 3/1/04

Peer Reviewer: Stacey Coker

Date Completed: 3/5/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Metals	Inorganics	VOCs	SVOCs	TPH
MMW-48A-T01N-GRW	SA	557817	8AT01NGRW	W	X	X	X[3]	X[3]	X[3]
MMW-48A-D01N-GRW	SA	557818		W	X				
MMW-48A-T01D-GRW	FD	557819	MW48AT01DGRW	W	X	X	X[3]	X[3]	X[3]
MMW-48A-D01D-GRW	FD	557820		W	X				
SC-4A-T01N-GRW	SA	557821		W	X	X			
SC-4A-D01N-GRW	SA	557822		W	X				
SC-6A-T01N-GRW	SA	557823		W	X	X			
SC-6A-D01N-GRW	SA	557824		W	X				
MMW-39A-T01N-GRW	SA	557825		W	X	X			
MMW-39A-D01N-GRW	SA	557826		W	X				
MMW-11A-T01N-GRW	SA	557827		W	X	X			
MMW-11A-D01N-GRW	SA	557828		W	X				
MMW-11A-T01D-GRW	FD	557829		W	X	X			
MMW-11A-D01D-GRW	FD	557830		W	X				
MMW-42A-T01N-GRW	SA	557831		W	X	X			
MMW-42A-D01N-GRW	SA	557832		W	X				
MMW-11-T01N-GRW	SA	557833		W	X	X			
MMW-11-D01N-GRW	SA	557834		W	X				

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FB = Field Blank RB = Rinsate Blank TB = Trip Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

[3]The associated field QC blanks were reported in WAT257C.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

These organic analyses were not required as part of the RI/FS QAPP and were conducted at the request of the client. The VOCs were analyzed by EPA method 8260, the SVOCs were analyzed by EPA method 8270 in the selective ion monitoring (SIM) mode, and TPH was analyzed by EPA method 8015M.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

Due to an instrument malfunction the total organic carbon (TOC) analyses were subcontracted to STL-St. Louis. However, STL-St. Louis also experienced instrument problems. As such, the analyses were subsequently performed 6 days beyond the prescribed analytical holding time. Table 1.1 summarizes the holding time qualifications. The data package provided by STL St. Louis was included at the end of the STL-Burlington submittal.

During the chloride analyses conducted on 1/17/04 (CCB2=0.230, CCB3=0.203, and CCB4=0.203) and 1/20/04 (ICB=0.216), the calibration check standards yielded concentrations that marginally exceeded the reporting limit of 0.2 mg/L. Only the samples with chloride concentrations greater than ten times those obtained in the blanks were reported from this analytical sequence; therefore no qualification was necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The nitrate analyses of the samples in this SDG were attempted within the analytical holding time on the day that they were received. However, due to an instrument malfunction, the acquisition was not successful. The samples were re-analyzed the following day, one day beyond the prescribed holding time. Also, sample MMW-39A-T01N-GRW required a follow-up dilution analysis, which was accomplished 4 days beyond the holding time. For a few samples, the 48-hour holding time was exceeded by less than 48 hours for nitrite as N and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 16 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Beryllium, iron, and potassium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS MMW-48A-T01N-GRW MMW-48A-D01N-GRW • LD MMW-48A-T01N-GRW MMW-48A-D01N-GRW	No	Matrix spike analyses were conducted on the inorganics, metal, VOC, SVOC, and TPH samples MMW-48A-T01N-GRW and MMW-48A-D01N-GRW. Several matrix spike results were outside acceptance limits. Table 1.3 summarizes the results and the data qualification issued for inorganics and metals. Table 1.4 summarizes the results and data qualification issued for VOCs and SVOCs. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MMW-48A-T01N-GRW MMW-48A-D01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on sample MMW-48A-T01N-GRW and MMW-48A-D01N-GRW, pH class A. Serial dilution result was applicable for 1 out of 24 metals. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of sample MMW-39A-T01N/D01N-GRW and MMW-11-T01N-GRW. Therefore, beryllium and molybdenum results for all samples were reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		Recovery for internal standard Li was high for the ICPMS analysis of all the samples in this SDG. Therefore, potassium results for all samples were reported from the trace ICP. The trace ICP potassium reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate (FD) MMW-48A-T01D/D01D-GRW MMW-11A-T01D/D01D-GRW • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	The field duplicate results satisfied the applicable concentration-dependent evaluation criteria and data qualification was not necessary. The field quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • VOCs/SVOCs: Initial and Continuing Calibration Table 1.5 summarizes the continuing calibration that did not meet criteria and the resultant data qualifications. • VOC: Laboratory Control Samples The volatile organic compounds (VOC) analysis of laboratory control samples NXID LCS and LCSD yielded a slightly low percent recoveries of the target compounds vinyl acetate, 1,2,4-trichlorobenzene, 1,2,3-trichlorobenzene, and tert-butylbenzene. Furthermore, NXID LCS and LCSD yielded slightly high percent recoveries of the target compounds dichlorofluoromethane, chloromethane, vinyl chloride, bromomethane, trichlorofluoromethane, trichloroethene, tetrachloroethene, and 1,1,2,2-tetrachloroethene. Table 1.6 summarizes the LCS and LCSD qualifications. • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	TOC (mg/L)	Conductivity (umhos/cm)	pH
MMW-48A-T01N-GRW	0.2 UJ	---	0.12 J	1.3 J	3030 J	5.5 J
MMW-48A-T01D-GRW	0.2 UJ	---	0.11 J	1.4 J	3090 J	5.4 J
SC-4A-T01N-GRW	0.27 J	---	0.010 UJ	0.92 J	2140 J	3.9 J
SC-6A-T01N-GRW	0.20 UJ	0.005 UJ	0.040 J	0.52 J	2380 J	3.7 J
MMW-39A-T01N-GRW	15.8 J	0.41 J	0.01 UJ	1.9 J	3900 J	4.4 J
MMW-11A-T01N-GRW	3.2 J	0.005 UJ	0.035 J	0.49 J	1780 J	4.7 J
MMW-11A-T01D-GRW	3.5 J	0.005 UJ	0.036 J	1.0 UJ	1790 J	4.4 J
MMW-42A-T01N-GRW	0.49 J	---	0.015 J	0.42 J	2320 J	3.5 J
MMW-11-T01N-GRW	3.6 J	0.005 UJ	0.026 J	0.49 J	1890 J	4.3 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=10	-1.0					1.0	MMW-48A-T01N-GRW, MMW-48A-D01N-GRW	UJ/J CCB-L
Iron (P) DF=100		59.5	53.6	70.2		42.3	SC-4A-T01N-GRW, SC-4A-D01N-GRW, SC-6A-T01N-GRW, SC-6A-D01N-GRW	U CCB-I
Potassium (P) DF=100			-1154.0	-1394.0		1099	All samples in this SDG with the following exceptions: MMW-48A-T01N-GRW, MMW-48A-D01N-GRW	UJ/J CCB-L

P=ICP MB = Method Blank CCBx=Continuing Calibration Blank IDL = Instrument Detection Limit L = Reporting Limit

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications (Inorganics and Metals)

Analyte	MS%R	PDS %R	Criteria	Comment	Action
MMW-48A-T01N-GRW					
Cadmium	157.2	104.7	75-125%	Parent sample result is nondetect	No qualification
Cobalt	158.3	105.8		Parent sample result is nondetect	No qualification
Copper	150.2	105.4		Parent sample result is nondetect	No qualification
Nickel	187.6	107.4		Parent sample result is nondetect	No qualification
MMW-48A-D01N-GRW					
Cobalt	131.7	102.4	75-125%	Parent sample result is nondetect	No qualification

Table 1.4
Matrix Spike Results and Parent Sample Qualifications (VOCs and SVOCs)

Analyte	MS%R	MSD %R	Criteria	Comment	Action
MMW-48A-T01N-GRW (VOC)					
Chloroethane	110	120	65-113%	Parent sample results are nondetect.	No qualification
Chloroprene	41	37	60-140%		UJ MS-L parent
Trichloroethene	110	110	70-109%		No qualification
2-Chloroethyl vinyl ether	0	0	60-140%		R MS-L parent
Xylene (total)	73*	73	60-140%		UJ MS-L parent
Xylene (m,p)	70	75	78-116%		UJ MS-L parent
Xylene (o)	75	73	81-125%		UJ MS-L parent
1,1,2,2-Tetrachloroethane	110	110	74-108%		No qualification
1,3,5-Trimethylbenzene	55	55	72-112%		UJ MS-L parent
1,2,4-Trimethylbenzene	70	71	75-123%		UJ MS-L parent
Styrene	37	35	80-124%		UJ MS-L parent
Bromoform	76	75	82-120%		UJ MS-L parent
MMW-48A-T01N-GRW (SVOC)					
Fluoranthene	150	117	60-140%	Parent sample results are nondetect	No qualification
Benzo (b) fluoranthene	150	117			No qualification
Benzo (a) pyrene	150	117			No qualification
Dibenz (a,h) anthracene	160	142			No qualification

NA = Not appropriate

*Although this 73% recovery was not outside the prescribed acceptance range of 60-140%, it was considered necessary to qualify the total xylene result as well, as all three isomers (m,p, and o) exhibited low recoveries.

Table 1.5
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

VOC CCAL Date/Time	Analyte	|%D| >25%	Action	Qualification and Qualification Codes
1/19/04 (2107)	Dichlorodifluoromethane	36.2%	Results for these analytes in associated samples were qualified as estimated.	UJ/J CCAL-I
	Cis-1, 4-dichlror-2-butene	36.8%		
	1,2,4-trichlorobenzene	31.6%		
	Naphthalene	39.1%		
	1,2,3-trichlorobenzene	26.8%		

Table 1.6
LCS and LCSD Results and Parent Sample Qualifications

Analyte	LCS%R	LCSD %R	Criteria	Comment	Action
(VOC) NXID					
Dichlorofluoromethane	**130%**	**120%**	78-116%	All VOC samples are nondetect for these analytes.	No qualification
Chloromethane	**130%**	110%	68-118%		No qualification
Vinyl chloride	**130%**	**120%**	78-118%		No qualification
Bromomethane	**130%**	**120%**	72-118%		No qualification
Trichlorofluoromethane	**120%**	110%	67-111%		No qualification
Vinyl acetate	**54%**	**49%**	60-140%		UJ LCS-L
Trichloroethene	**110%**	**110%**	70-109%		No qualification
Tetrachloroethene	**120%**	140%	71-107%		No qualification
1,1,2,2-Tetrachloroethene	**110%**	**110%**	74-108%		No qualification
1,2,4-trichlorobenzene	**75%**	**77%**	81-135%		UJ LCS-L
Tert-butylbenzene	87%	**79%**	80-124%		UJ LCS-L
1,2,3-trichlorobenzene	**79%**	83%	81-137%		UJ LCS-L

Bolded % Rs = The analytes outside of LCS/LCSD recovery limits.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT259C

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water X Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Ansley Watson

Date Completed: 2/19/04

Peer Reviewer: Stacey Coker

Date Completed: 2/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
SC-8A-T01N-GRW	SA	557869		W	X	X
SC-8A-D01N-GRW	SA	557870		W	X	
MMW-42B-T01N-GRW	SA	557871		W	X	X
MMW-42B-D01N-GRW	SA	557872		W	X	
SC-1B-T01N-GRW	SA	557873		W	X	X
SC-1B-D01N-GRW	SA	557874		W	X	
MMW-13-T01N-GRW	SA	557875		W	X	X
MMW-13-D01N-GRW	SA	557876		W	X	
SC-2B-T01N-GRW	SA	557877		W	X	X
SC-2B-D01N-GRW	SA	557878		W	X	
SC-5B-T01N-GRW	SA	557879		W	X	X
SC-5B-D01N-GRW	SA	557880		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 15 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony, potassium, silver, thallium, and vanadium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	There were no matrix quality control samples in this SDG. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution SC-8A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on sample SC-8A-T01N-GRW, pH class C, and were applicable for 0 out of 24 metals each. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	There were no field quality control results is this SDG. The field quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	Yes	
Quantification	Yes	

Review Parameter	Criteria Met?	Comments
Laboratory-specific Parameters	Complete with "Yes," "No," or "Not Applicable (NA)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Yes	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. Acceptable performance is inferred from the ongoing QC sample results, which satisfied evaluation criteria.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
SC-8A-T01N-GRW	0.20 J	---	0.01 UJ	284 J	6.5 J
MMW-42B-T01N-GRW	0.20 UJ	0.005 UJ	0.037 J	2420 J	7.0 J
SC-1B-T01N-GRW	---	---	---	2740 J	6.9 J
MMW-13-T01N-GRW	3.4 J	0.005 UJ	0.01 J	1440 J	7.1 J
SC-2B-T01N-GRW	0.20 UJ	---	0.01 UJ	1850 J	6.6 J
SC-5B-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	1950 J	7.2 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS) DF=2	1.5	1.5	1.5		3.002	0.2	All the samples in this SDG.	U CCB, MB-I
Potassium (P) DF=10			-1308	-1360		1099	MMW-13-T01N-GRW, MMW-13-D01N-GRW, SC-2B-T01N-GRW, SC-2B-D01N-GRW, SC-5B-T01N-GRW, SC-5B-D01N-GRW	J CCB-L
Silver (MS) DF=2	-0.1	-0.1	-0.1		-0.266	0.1	All the samples in this SDG	UJ CCB, MB-L
Thallium (MS) DF=2	0.2	0.1	0.1		0.286	0.1	All the samples in this SDG	U CCB, MB-I
Vanadium (MS) DF=2	0.1	0.2	0.2		0.206	0.1	All the samples in this SDG	U CCB, MB-I

P=ICP MB = Method Blank CCBx=Continuing Calibration Blank IDL = Instrument Detection Limit RL=

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT260A

Sampling Event: January 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson

Date Completed: 2/22/04

Peer Reviewer: Stacey Coker

Date Completed: 2/25/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	VOCs	Explosives
SC-7A-T01N-GRW	SA	557881		W	X	X		
SC-7A-D01N-GRW	SA	557882		W	X			
SC-1A-T01N-GRW	SA	557883		W	X	X		
SC-1A-D01N-GRW	SA	557884		W	X			
SC-3A-T01N-GRW	SA	557885		W	X	X		
SC-3A-D01N-GRW	SA	557886		W	X			
MMW-38A-T01N-GRW	SA	557887		W	X	X		
MMW-38A-D01N-GRW	SA	557888		W	X			
SC-5A-T01N-GRW	SA	557889		W	X	X		
SC-5A-D01N-GRW	SA	557890		W	X			

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FB = Field Blank RB = Rinsate Blank TB = Trip Blank FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N and nitrite as N. The analysis for pH and conductivity were exceeded by 2 and 14 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Beryllium, boron, and iron were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	NA	There were no matrix quality control samples in this SDG. The matrix quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution SC-7A-T01N-GRW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on sample SC-7A-T01N-GRW, pH class A, and was applicable for 0 out of 24 metals. The serial dilution results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Recovery for internal standard Y was high for the ICPMS analysis of samples SC-1A-T01N-GRW and MMW-38A-T01N-GRW and MMW-38A-D01N-GRW. Therefore, beryllium and molybdenum results for all samples were reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exception of samples SC-7A-T01N/D01N-GRW and SC-5A-T01N/D01N-GRW. All percent differences were verified independently. The laboratory case narrative notes that the results compared well with historical results. However, the laboratory suspects the elevated cation reporting limits (potassium and sodium) associated with dilutions for class "A" samples may be the cause of the elevated percent differences. No qualifications were issued on the basis of cation/anion balances, as the results were not an appropriate measure of accuracy.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	There were no field quality control samples in this SDG. The field quality control results for the January 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
SC-7A-T01N-GRW	0.20 UJ	0.005 UJ	0.032 J	1260 J	4.6 J
SC-1A-T01N-GRW	0.20 UJ	0.005 UJ	0.042 J	2240 J	3.9 J
SC-3A-T01N-GRW	0.21 J	0.005 UJ	0.01 UJ	1990 J	3.5 J
MMW-38A-T01N-GRW	1.1 J	0.0092 J	0.022 J	6230 J	3.2 J
SC-5A-T01N-GRW	0.20 UJ	0.005 UJ	0.01 UJ	929 J	3.6 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=10		0.4	0.4			0.3	SC-7A-T01N-GRW, SC-7A-D01N-GRW, SC-5A-T01N-GRW, SC-5A-D01N-GRW	U CCB-I
Boron (P) DF=10	4.4	3.7	4.6		2.905	2.3	SC-7A-T01N-GRW, SC-7A-D01N-GRW, MMW-38A-T01N-GRW, MMW-38A-D01N-GRW	U CCB, MB-I
Iron (P) DF=100				39.2		35.7	MMW-38A-T01N-GRW, MMW-38A-D01N-GRW	U CCB-I

P=ICP MB = Method Blank CCBx=Continuing Calibration Blank IDL = Instrument Detection Limit RL=

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA VALIDATION REPORT
FOR THE
FEBRUARY 2004 SPECIALTY GROUNDWATER AND SURFACE WATER SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

March 2005

URS

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Project No. 22236241.00100

141963

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Dilution Scheme/Non-Detects with Elevated RLs 3-1
3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 3-1
3.2.3 Non-Valid Matrix Spikes 3-1
3.2.4 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Assessment Of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-4
4.3 ICP Serial Dilution Results 4-5

Section 5 Collective Assessment of Field QC Results 5-1

5.1 Field Duplicate Agreement 5-1
5.2 Rinsate Blank Results 5-2
5.3 Evaluaton of Secondary Filtration Sample Results 5-3

Section 6 Non-Routine Analyses 6-1

6.1 Frontier Geosciences, Inc. 6-1
6.2 University of Arizona 6-2
6.3 University of Miami 6-2

Section 7 Overall Data Quality Indicator Assessment 7-1

7.1 Precision 7-1
7.2 Accuracy 7-1
7.3 Completeness 7-2
7.4 Representativeness 7-2
7.5 Comparability 7-3
7.6 Sensitivity 7-3

TABLE OF CONTENTS

List of Tables

Table 1.1	Summary of Groundwater Samples Collected February 2004
Table 1.2	Summary of Surface Water Samples Collected February 2004
Table 1.3	Summary of Non-Routine Analyses for February 2004 Sampling
Table 4.1.1	Field Samples Designated for Matrix QC Analysis
Table 4.1.2	Frequency Requirements for Matrix QC
Table 4.1.3	Inorganics Matrix Spike Results
Table 4.1.4	Metals Matrix Spike Results
Table 4.2.1	Inorganic Laboratory Duplicate Results
Table 4.3.1	ICP Serial Dilution Results
Table 4.3.2	ICP Serial Dilution Overall Assessment
Table 5.1.1	Summary of Field Duplicate Samples Collected February 2004
Table 5.1.2	Field Duplicate Collection Frequency for the February 2004 Sampling Event
Table 5.1.3	Field Duplicate Qualifications Assigned to Parent Samples for the February 2004 Sampling Event
Table 5.2.1	Summary of Rinsate Blank Samples Collected February 2004
Table 5.2.2	Summary of Rinsate Blank Results and Additional Qualifications
Table 7.1	Summary of Precision Assessment for February 2004
Table 7.2	Summary of Accuracy Assessment for February 2004

List of Attachments

Attachment 1.1	Data Review Summary for Data Package WAT261A
Attachment 1.2	Data Review Summary for Data Package WAT262A
Attachment 1.3	Data Review Summary for Data Package WAT263C
Attachment 1.4	Data Review Summary for Data Package WAT264A
Attachment 1.5	Data Review Summary for Data Package WAT265S
Attachment 1.6	Data Review Summary for Data Package WAT266A
Attachment 1.7	Data Review Summary for Frontier Geosciences, Inc. Data Package

This Data Validation Report (DVR) provides a general overview of the usability of chemical data obtained during the February 2004 Specialty Groundwater and Surface Water Sampling Event at Molycorp Questa Mine in Questa, New Mexico. This report contains the results and process of the sample specific data reviews and collective evaluations for the water samples collected in support of the Remedial Investigation/Feasibility Study (RI/FS) during the month of February 2004. In addition, this report covers one groundwater sample collected in association with the February 2004 installation of mine monitoring well MMW-50A.

February 2004 RI/FS water samples and March 2004 groundwater sample from MMW-50A were submitted to Severn Trent Laboratories (STL) Burlington in Colchester, Vermont for chemical analysis. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods utilized were according to the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). Sample and QC results were reported in five original packages.

Tables 1.1 and 1.2 summarize the groundwater and surface water samples collected during this sampling event which were submitted to STL for routine chemical analysis, along with the analyses performed on each sample and the accompanying QC samples.

Table 1.1
Summary of Groundwater Samples Collected February 2004

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics
AWWT-1-T01N-GRW (WAT264A)	X	X	X[2]
AWWT-2-T01N-GRW (WAT263C)	X	X	X[2]
CC-2A-T01N-GRW (WAT263C)	X	X	X[3]
HANSEN-T01N-GRW (WAT261A)	X, FD	X, FD	X, FD[2]
HAUT-N-TAUT-T01N-GRW (WAT264A)	X, MS, LD	X, MS, LD	X, MS, LD[2]
LABOBITA-T01N-GRW (WAT262A)	X, RB	X, RB	X, RB[2]
MMW-2-T01N-GRW (WAT263C)	X	X	X[3]
MMW-7-T01N-GRW (WAT261A)	X, RB	X, RB	X, RB[3]
MMW-11A-T01N-GRW (WAT261A)	X, MS, LD	X, MS, LD	X, MS, LD[3]
TANK1-T01N-STW (WAT261A)[4]	X	X	X[3]
MMW-17B-T01N-GRW (WAT261A)	X	X	X[3]
MMW-21-T01N-GRW (WAT261A)	X	X	X[3]
MMW-22-T01N-GRW (WAT261A)	X	X	X[3]
MMW-23A-T01N-GRW (WAT264A)	X	X	X[3]
MMW-24-T01N-GRW (WAT262A)	X	X	X[3]
MMW-28A-T01N-GRW (WAT263C)	X	X	X[3]
MMW-28B-T01N-GRW (WAT262A)	X	X	X[3]
MMW-29A-T01N-GRW (WAT264S)	X	X	X[3]
MMW-29B-T01N-GRW (WAT263C)	X	X	X[3]
MMW-30A-T01N-GRW (WAT264A)	X, FD	X, FD	X, FD[3]
MMW-30B-T01N-GRW (WAT263C)	X	X	X[3]
MMW-36B-T01N-GRW (WAT262A)	X	X	X[3]
MMW-38A-T01N-GRW (WAT262A)	X	X	X[3]
MMW-39A-T01N-GRW (WAT262A)	X	X	X[3]
MMW-44A-T01N-GRW (WAT262A)	X	X	X[3]
MMW-45A-T01N-GRW (WAT261A)	X	X	X[3]
SC-1A-T01N-GRW (WAT264A)	X	X	X[3]
SC-1B-T01N-GRW (WAT263C)	X	X	X[3]
SC-8A-T01N-GRW (WAT263C)	X	X	X[3]

Table 1.1
Summary of Groundwater Samples Collected February 2004

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics
SPRING-13-T01N-GRW (WAT261A)	X	X	X[3]
MWW-50A-T01N-GRW (WAT266A)	X	X	X[2]
Number GRW Samples[5]	30	30	30
Number MS/MSD or MS/LD	2	2	2
Number Field Duplicates	2	2	2
Number Rinsate Blanks	2	2	2

FD = Field Duplicate MS = Matrix Spike LD = Laboratory Duplicate RB = Rinsate Blank

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

[2]Full inorganic suite.

[3]Limited inorganic suite of fluoride, sulfate, TDS, and TSS.

[4]Sample is from storage tank of water for disposal; not a routine groundwater sample.

[5]Excluding TANK 1 sample.

Table 1.2
Summary of Surface Water Samples Collected February 2004

Sample Identification	Total Metals	Dissolved Metals	Inorganics[2]
COLUMBINE CREEK-T01N-SFW	X, FD	X, FD	X, FD
RR-7-T01N-SFW (WAT265S)	X, MS, LD	X, MS, LD	X, MS, LD
RR-10-T01N-SFW (WAT265S)	X, RB	X, RB	X, RB
RR-14-T01N-SFW (WAT265S)	X	X	X
Number SFW samples	4	4	4
Number MS/MSD or MS/LD	1	1	1
Number Field Duplicates	1	1	1
Number Rinsate Blanks	1	1	1

FD = Field Duplicate MS = Matrix Spike LD = Laboratory Duplicate RB = Rinsate Blank

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

[2]Limited inorganic suite of fluoride, sulfate, TDS and TSS.

In addition to the routine chemical analyses performed on each groundwater and surface water sample by STL-B, selected samples were analyzed for selected non-routine parameters. Table 1.3 lists the additional analyses performed and the laboratories conducting the analyses.

Table 1.3
Summary of Non-Routine Sample Analyses

Site ID	Specialty Analyses by Laboratory						
	University of Arizona		University of Miami	Frontier Geosciences (Seattle, WA)			
	Stable Isotopes of Water	Dissolved Sulfur Isotopes, Dissolved Sulfur	Helium/Tritium	Total Lead Isotopes, Total Lead	Dissolved Lead, Isotopes, Dissolved Lead	Total Lanthanides	Dissolved Lanthanides
Groundwater							
AWWT-1							
Hansen							
Haut-N-Taut							
La Bobita							
SC-1A	X	X	X	X	X		
MMW-7	X	X	X	X, RB (tPb)	X, RB (dPb)	X, RB	X
MMW-11A	X	X	X, FD	X	X	X	X
MMW-17A	NC		NC			X	X
MMW-17B	X, FD		X, FD				
MMW-21	X		X			X	X[2]
MMW-22	X		X				
MMW-23A		X		X	X		
MMW-24	X		X				
MMW-28B	X		X				
MMW-29A	X		X, D			X	X
MMW-30A	X	X	X, D	X, FD	X, FD (dPb)	X, FD	X, FD[2]
MMW-36B	X	X	X	X	X	X	X
MMW-38A	X	X	X	X	X	X	X
MMW-39A	X	X	X	X	X	X	X
MMW-44A		X		X	X		
MMW-45A	X	X		X	X	X	X
Spring 13		X, RB	X, FD[1]	X	X		
AWWT-2							
CC-2A		X		X	X		
SC-1B	X		NM				
SC-8A	X						
MMW-2		X		X	X		
MMW-28A	X		X				
MMW-29B	X		X				
MMW-30B	X		X			X	X[2]
Surface Water							
Columbine Creek	X, FD						
RR-7	X						
RR-10	X						
RR-14	X						

Table 1.3
Summary of Non-Routine Sample Analyses

Site ID	Specialty Analyses by Laboratory						
	University of Arizona		University of Miami	Frontier Geosciences (Seattle, WA)			
	Stable Isotopes of Water	Dissolved Sulfur Isotopes, Dissolved Sulfur	Helium/Tritium	Total Lead Isotopes, Total Lead	Dissolved Lead, Isotopes, Dissolved Lead	Total Lanthanides	Dissolved Lanthanides
Standard Reference Materials							
PPREE 1						X	
SCREE 1						X	
Total Number of Field Samples	**23**	**13**	**17**	**13**	**13**	**11**	**11**

[1]Spring 13 sample was collected on 5/10/04; tritium result for this sample was measured by radioactive counting. A duplicate of the tritium sample was held in storage for He+3 in-growth determination: results were reported separately.

[2]Two-step filtration test to evaluate adsorption of lanthanides to the filter material; secondary filtered sample labeled with "D02N".

NM = Not measured due to over-tightened clamp on sampler

dPb = Dissolved lead only

TPb = Total lead only

FD = Field duplicate

D = Laboratory duplicate or replicate

R = Replicable analyses for lead isotopes

RB = Rinsate blank

NC = Not collected due to field oversight

The review of the non-routine sample results was limited to the deliverables provided. The results of the data review are provided in Section 6.0.

The data review process evaluated sample-specific and laboratory performance criteria in accordance with the standard operating procedure (SOP) 12.1. As mentioned in the SOP, all RI/FS data generated for the Questa Mine received an evaluation of sample-specific parameters. In addition, 10% of the data packages (per analysis type per event/episode) were reviewed for laboratory performance parameters. The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Sample-specific reviews evaluated the following sample related parameters:

Case narrative comments

Chain-of-Custody/Sample Receipt

Holding Times

Method Blank (Preparation Blank)

Matrix-Dependent Quality Control

- Matrix Spike Analysis
- Laboratory duplicate Analysis

Method-Specific Quality Control Measures

- Inorganic Method Specific QC Measures
  - Post Digestion Spike Analysis
  - ICP Serial Dilution Tests
  - Internal Standard Performance
  - Cation/Anion Balance Evaluation
- Organic Method Specific QC Measures
  - Surrogate Spike Compound Recovery
  - Internal Standards

Total vs. Partial Balance

Field quality control samples

- Field Duplicate Agreement
- Rinsate Blank Results
- Field Blank Results
- Trip Blank Results

Evaluation of laboratory performance parameters provided an overall representation of the analytical system at the time the samples were analyzed. The laboratory performance review evaluated parameters in control of the laboratory, but independent of the field samples analyzed, as follows:

Initial Calibration

Continuing Calibration Verification

Laboratory Control Sample Analysis

Compound Identification

Target Analyte Quantification

Verification

Method Specific Quality Control Checks

If any potential systematic problems were determined upon review of the laboratory performance parameters in any of the selected packages evaluated (meeting the 10% criteria), the review parameter was evaluated in all data packages for February 2004 to determine the need for data qualification. Instances, in which professional judgment was exercised in evaluating the need for data qualification, the basis for this rationale was provided in the data review summary.

Upon completion of the sample-specific reviews and laboratory performance reviews, a collective assessment for the event was performed. Site-specific matrix spike, laboratory duplicate, serial dilution, blank (field and rinsate), and field duplicate results were assessed collectively by matrix per event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered more representative of the site sample matrix and a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 3.0 describes sample specific data review findings and several data quality issues affecting all of the water packages. Section 4.0 presents the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Section 5.0 summarizes the collective summary of the field QC results (field and rinsate blanks, when applicable, and field duplicate results) and the resultant sample qualification. Section 6.0 briefly summarizes the non-routine analyses. Lastly, an overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 7.0.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for data packages WAT261C through WAT266A, for a total of six STL-B data packages. In order to attain the frequency requirements for laboratory performance reviews, two data packages (WAT261C and WAT266A) were evaluated for laboratory performance criteria. In addition, laboratory performance parameters for the Frontier Geosciences data package were reviewed to the extent allowed by the deliverables provided. Results of the laboratory performance reviews are summarized in the individual data review summary reports. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several issues were identified which globally affected all relevant water samples analyzed for the February and March 2004 Groundwater and Surface Water Sampling Events. Although these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them in this collective assessment.

3.2.1 Dilution Scheme/Non-Detects with Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilbria were found to affect the matrix spike recoveries more than the expected accuracy of the analyses. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not used to assess the accuracy of the analysis.

3.2.3 Non-Valid Matrix Spikes

There were a total of three scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. First, when native sample

concentrations were greater than or equal to four times the spiking concentration, the ability to determine accuracy in the analysis was not accurate as the difference in the spike level with the original analyte concentration was not so discernable due to high concentration levels. In addition, there were several instances in which the reporting limits for various metal analytes were increased due to dilution factors, which affected the reliable quantitation of several spiked metals. In these situations, the reporting limit was greater than the spike concentration added. Related to this scenario, is the last instance in which the difference between the RL concentration and the spike concentration was less than the RL value.

3.2.4 Laboratory Performance Review (LPR) Findings

As mentioned previously, two STL-B data packages were given a full validation to assess the performance of the laboratory for all analyses. Any findings resulting in data qualification were examined in all other February and March 2004 Groundwater and Surface water packages to determine if data qualification would be extended to these additional packages.

Metals: Interference Check Sample Results

Inorganic parameter matrix QC consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. The site-specific matrix QC results were assessed collectively for the February and March 2004 Groundwater and Surface Water Sampling Events by matrix (groundwater vs. surface water, and total vs. dissolved fractions) to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.3 present the collective matrix QC results associated with the samples in this event and the resultant data qualifiers.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent quality control (QC) samples were used to evaluate how the sample matrix affected the accuracy and precision of the analytical results. Two groundwater field samples were designated for both total and dissolved metals, in addition to inorganics matrix spike analyses. One surface water field sample was designated for total and dissolved metals, in addition to inorganics matrix spike analyses, as summarized in Table 4.1.1. Table 4.1.2 summarizes the breakdown of frequency requirements for each of the analyses per groundwater and surface water for the February and March 2004 Groundwater and Surface Water Sampling Events.

Table 4.1.1
Field Samples Designated for Matrix QC Analysis

Sample ID (SDG)	Analyses		
	Total Metals	Dissolved Metals	Inorganics
GROUNDWATER			
LABOBITA-T01N-GRW (WAT262A)	X	X	X
MMW-11A-T01N-GRW (WAT261A)	X	X	X
SURFACE WATER			
RR-7-T01N-SFW (WAT265S)	X	X	X

Table 4.1.2
Frequency Requirements for Matrix QC

Analyses	# MS Samples	Total # Samples	Percentage (%)
GROUNDWATER			
Total Metals	2	30	6.7
Dissolved Metals	2	30	6.7
Inorganics	2	30	6.7
SURFACE WATER			
Total Metals	1	4	25
Dissolved Metals	1	4	25
Inorganics	1	4	25

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

None of the matrix spike recoveries for inorganic analytes were reported outside the acceptance range for groundwater or surface water matrix spike samples. Several metal analytes were recovered for both groundwater and surface water samples outside the acceptance range. The following tables (4.1.3 and 4.1.4) summarize the results for each analyte, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 4.1.3
Inorganics Matrix Spike Results

Analyte	Number of Valid Spikes/ Total Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
INORGANICS GROUNDWATER					
Chloride	1/2	0	0	92	NQ
Nitrate	1/2	0	0	87	
Fluoride	2/2	0	0	90	
Ammonia	1/2	0	0	85	
TKN	1/2	0	0	105	
Nitrite	1/2	0	0	100	
Ortho-phosphate	1/2	0	0	100	
Phosphorus	1/2	0	0	102	
Sulfate	2/2	0	0	91	
TOC	1/2	0	0	84	
INORGANICS SURFACE WATER					
Chloride	0	0	0	---	NQ
Nitrate	0	0	0	---	
Fluoride	1/1	0	0	98	
Ammonia	0	0	0	---	
TKN	0	0	0	---	
Nitrite	0	0	0	---	
Ortho-phosphate	0	0	0	---	
Phosphorus	0	0	0	---	
Sulfate	1/1	0	0	102	
TOC	0	0	0	---	

NQ = No qualification

Data qualification on the basis of matrix spike recoveries for inorganic analytes was not necessary for any groundwater or surface water samples, as all matrix spike recoveries fell within the acceptance range of 75-125%. The accuracy of the analyses relative to the site-specific matrix was acceptable.

Table 4.1.4
Metals Matrix Spike Results

Analyte	Total				Dissolved				Action
	# Valid	%R <75%	%R > 125%	Avg %R	# Valid	%R <75%	%R > 125%	Avg %R	
METALS GROUNDWATER									
Aluminum	1	0	0	102.8	1	0	0	102.2	NQ
Antimony	2	0	0	106.5	2	0	0	105.7	
Arsenic	2	0	0	109.8	2	0	1	126.9	Arsenic result in dissolved fraction parent sample qualified **J MS-H**
Barium	2	0	0	101.6	2	0	0	100.1	NQ
Beryllium	2	0	0	104.5	2	0	0	102.9	
Boron	2	0	0	106.2	2	0	0	104.7	
Cadmium	2	0	1	159.2	2	1	1	107.2	Cadmium results for all dissolved fraction samples qualified **J/UJ MS-I**. NQ (ND) for total parent sample
Chromium	2	0	0	107.5	2	0	0	110.5	NQ
Cobalt	2	0	1	117.8	2	0	0	107.4	NQ (ND)
Copper	2	0	0	106.0	2	0	0	102.7	NQ
Iron	0	---	---	---	0	---	---	---	
Lead	2	0	0	96.9	2	0	0	100.4	
Manganese	1	0	0	104.0	1	0	0	100.3	
Mercury	2	0	0	97.4	2	0	0	91.2	
Selenium	2	0	0	101.8	2	0	0	105.5	
Molybdenum	2	0	0	103.4	2	0	0	102.1	
Silver	2	0	0	93.5	2	0	0	97.5	
Nickel	2	0	0	118.4	2	0	1	122.1	ND (NQ)
Thallium	2	0	0	98.1	2	0	0	99.8	NQ
Vanadium	2	0	0	97.9	2	0	0	98.4	
Zinc	1	0	0	110.9	1	0	0	103	
Cyanide	1	0	0	90.2	0	---	---	//	
METALS SURFACE WATER									
Aluminum	1	0	0	98.7	1	0	0	99.6	NQ
Antimony	1	0	0	104	1	0	0	95.9	
Arsenic	1	0	0	106.6	1	0	0	99.6	
Barium	1	0	0	95.6	1	0	0	96.9	
Beryllium	1	0	0	97.8	1	0	0	98	
Boron	1	0	0	95.5	1	0	0	95.5	
Cadmium	1	0	0	104.1	1	0	0	93.3	
Chromium	1	0	0	97.2	1	0	0	97.4	
Cobalt	1	0	0	95.6	1	0	0	95.3	
Copper	1	0	0	110.6	1	0	0	101.8	
Iron	1	0	0	98.6	1	0	0	99.6	
Lead	1	0	0	109.8	1	0	0	100.6	
Manganese	1	0	0	96.8	1	0	0	97.1	
Mercury	1	0	0	100	1	0	0	93.1	
Molybdenum	1	0	0	105.9	1	0	0	101.2	
Selenium	1	0	0	95.1	1	0	0	91.2	
Nickel	1	0	0	111	1	0	0	101.2	
Thallium	1	0	0	109.8	1	0	0	100.2	
Silver	1	0	0	107.4	1	0	0	99.4	
Vanadium	1	0	0	108.4	1	0	0	98.7	
Zinc	1	0	0	97	1	0	0	96.8	
Cyanide	0	0	0	//	0	0	0	//	

Valid = Number of valid spikes/total spikes --- = Not applicable NQ = No Qualification issued

// Cyanide was not analyzed for dissolved metal fractions or dissolved surface water

ND (NQ) = No Qualification issued based on Non Detect results with a high bias **Qualifications** which resulted are in bold type

Metals Matrix Spikes

All groundwater dissolved cadmium sample results were qualified as estimated (J/UJ) with an indeterminate bias direction assigned, as one of the matrix spike recovery was in excess of the upper limit of the acceptance range, and the other was below the lower limit of the acceptance range.

Arsenic, total cadmium, cobalt, and nickel results were evaluated for qualification in the parent samples only, considering the frequency and magnitude of the exceedances. As indicated in the table, the accuracy of the analyses relative to the site-specific matrix was acceptable.

Post-Digestion Spikes

Post-digestion spikes were conducted on all ICP and ICP/MS analytes to determine whether matrix recoveries outside of the acceptance range were the result of sample matrix, or due to a bias in the analytical system. All post digestion recoveries for those analytes recovered outside of the acceptance range were reviewed and recovered within the range of 75-125%. Therefore, no qualification of data was assigned for any of the metal analytes on the basis of post-digestion spike recovery, as it was likely that all matrix spike exceedances were due to a matrix effect on digestion rather than a bias in the analytical system.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Laboratory duplicate sample results were evaluated to assess the precision of the laboratory analyses. The same two groundwater samples and one surface water sample utilized for matrix spike evaluations were also designated for metals (total and dissolved) and inorganic parameters laboratory duplicate analyses. The evaluation criteria used are summarized in SOP 12.1. For metals, the Contract Laboratory (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

The RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within the QAPP acceptance limits for all laboratory duplicate analyses, with the exception of one TSS result in the surface water sample. TSS results in surface water samples were qualified globally as estimated, with an indeterminate bias direction assigned. In this instance, the laboratory duplicate result for the QC sample was enough to represent the small number of surface water samples (1/4).

Table 4.2.1
Inorganic Laboratory Duplicate Results

Analyte	Sample ID	Criterion	Criterion Exceedances	Action
INORGANICS				
TSS	HUNT1-T01N-SFW	|Diff| <1xRL	14xRL	J/UJ D-I all SFW sample results for TSS

As all samples designated for matrix spike analyses (MS) were also designated for either a matrix spike duplicate (MSD) or laboratory duplicate (LD) analysis, the sample frequency for the analyses of laboratory duplicates were the same as summarized in Table 4.1.2.

Based on the LD results, the overall level of precision demonstrated is considered to be acceptable.

4.3 ICP SERIAL DILUTION RESULTS

ICP serial dilutions were performed on metal samples in every data package. These analyses were run on the same samples as were designated for QC analyses, or otherwise selected in data packages in which there were no QC samples. These analyses were used to evaluate whether or not significant physical or chemical interferences existed due to sample matrix. This was accomplished by analyzing the sample and a five-fold dilution of the sample. The percent difference (%D) between these two concentrations was compared to an acceptance criterion of $\leq$10%, only for those analytes for which the serial dilution analysis was applicable. Analytes were applicable if the initial concentrations were sufficiently higher (50x) than the IDL, accounting for dilution. Generally, the diluted result is considered more accurate as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result. The following table (4.3.1) summarizes each sample utilized for a serial dilution analysis, along with the associated applicable analytes, and the analytes for which qualification in the parent sample was necessary (designated by bold text).

Qualifications were generally limited to the parent samples if less than a quarter of the valid serial dilution results were outside of the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set and the magnitude of outages were also taken into consideration.

Table 4.3.1
ICP Serial Dilution Results

Sample ID	Applicable Analytes (%D>10% in bold)
GROUNDWATER –DISSOLVED FRACTION	
MMW-11A-D01N-GRW (WAT261A)	Mn
LABOBITA-D01N-GRW (WAT262A)	**Ba (20.2)**
GROUNDWATER –TOTAL FRACTION	
MMW-11A-T01N-GRW (WAT261A)	Mn
LABOBITA-T01N-GRW (WAT262A)	**Ba (15.1)**
MMW-36B-T01N-GRW (WAT263C)	B, Ca
MMW-30A-T01N-GRW (WAT264A)	Mn
SURFACE WATER DISSOLVED FRACTION	
RR-7-D01N-SFW (WAT265S)	All analytes with the exception of K **Cd (14.4), Ni (10.6)**
SURFACE WATER-TOTAL FRACTION	
RR-7-T01N-SFW (WAT265S)	All analytes with the exception of K **Se (18.0)**

Table 4.3.2 summarizes the average % Ds for each of the analytes, broken down into total and dissolved fractions, along with the percent of applicable analytes that exceeded control criteria (10%) for both groundwater and surface waters, and the results qualifiers based on the collective assessment.

Table 4.3.2
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	Avg. %D	#Ds >10%	# of Valid Results	% Valid Result >10%	Avg. %D	#Ds >10%	# of Valid Results	% Valid Result >10%	
GROUNDWATER									
Aluminum	---	---	0	---	---	---	0	---	NQ
Antimony	---	---	0	---	---	---	0	---	
Arsenic	---	---	0	---	---	---	0	---	
Barium	15.1	1	1	100	20.2	1	1	100	Total and dissolved detected barium results qualified **J DL-H** NQ (ND)
Beryllium	---	---	0	---	---	---	0	---	NQ
Boron	5.2	0	1	0	---	---	0	---	
Cadmium	---	---	0	---	---	---	0	---	
Calcium	0.2	0	1	0	---	---	0	---	
Chromium	---	---	0	---	---	---	0	---	
Cobalt	---	---	0	---	---	---	0	---	
Copper	---	---	0	---	---	---	0	---	
Iron	---	---	0	---	---	---	0	---	
Lead	---	---	0	---	---	---	0	---	
Magnesium	---	---	0	---	---	---	0	---	
Manganese	4.5	0	2	0	1.8	0	1	0	
Molybdenum	---	---	0	---	---	---	0	---	
Nickel	---	---	0	---	---	---	0	---	
Potassium	---	---	0	---	---	---	0	---	
Selenium	---	---	0	---	---	---	0	---	
Silver	---	---	0	---	---	---	0	---	
Sodium	---	---	0	---	---	---	0	---	
Thallium	---	---	0	---	---	---	0	---	
Vanadium	---	---	0	---	---	---	0	---	
Zinc	---	---	0	---	---	---	0	---	
SURFACE WATER									
Aluminum	0.8	0	1	0	0.6	0	1	0	NQ
Antimony	4.7	0	1	0	7.5	0	1	0	
Arsenic	7.0	0	1	0	4.1	0	1	0	
Barium	2.3	0	1	0	2.4	0	1	0	
Beryllium	3.7	0	1	0	5.9	0	1	0	
Boron	5.0	0	1	0	6.1	0	1	0	
Cadmium	2.6	0	1	0	14.4	1	1	100	Dissolved cadmium results qualified **J/UJ DL-L**
Calcium	2.8	0	1	0	4.7	0	1	0	NQ
Chromium	1.3	0	1	0	0.1	0	1	0	
Cobalt	3.1	0	1	0	5.1	0	1	0	
Copper	3.3	0	1	0	4.7	0	1	0	
Iron	1.4	0	1	0	1.8	0	1	0	
Lead	0.8	0	1	0	3.0	0	1	0	

Table 4.3.2
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	Avg. %D	#Ds >10%	# of Valid Results	% Valid Result >10%	Avg. %D	#Ds >10%	# of Valid Results	% Valid Result >10%	
Magnesium	2.7	0	1	0	4.0	0	1	0	
Manganese	2.6	0	1	0	5.6	0	1	0	NQ
Molybdenum	4.2	0	1	0	5.1	0	1	0	
Nickel	8.0	0	1	0	10.6	1	1	100	Dissolved nickel result in parent sample qualified **J DL-L**
Potassium	---	0	0	0	---	0	0	0	NQ
Selenium	18.0	1	1	100	5.5	0	1	0	Total selenium results qualified **J/UJ DL-L**
Silver	0.1	0	1	0	3.8	0	1	0	NQ
Sodium	5.7	0	1	0	0.9	0	1	0	
Thallium	0.6	0	1	0	4.3	0	1	0	
Vanadium	0.6	0	1	0	5.6	0	1	0	
Zinc	3.8	0	1	0	5.7	0	1	0	

NQ = No Qualification NQ (ND) = No qualification for nondetect results with potential high bias

Groundwater

As summarized in the table above, two serial dilution results, for which the analytes were applicable in groundwater samples, were in excess of 10%. As both total and dissolved groundwater fractions for barium (of the one applicable analysis for each fraction) were in excess of the evaluative criterion, and the %Ds were of considerable magnitude (15.1% and 20.2%, respectively), qualification of detected barium results was extended to all groundwater samples with a high bias direction assigned. Nondetect barium results in groundwater samples were not qualified.

Surface Water

All analytes for both total and dissolved surface water fractions were applicable to the serial dilution analyses, with the exception of potassium, as all other initial sample results were sufficiently larger (50x) than the IDL. The %D for three analytes, total selenium (18.0%), dissolved cadmium (14.4%), and dissolved nickel (10.6%), were in excess of 10%. One serial dilution result for four surface water samples was considered representative and considering the magnitude of the exceedances, qualification was extended to total surface water sample results for selenium and dissolved surface water sample results for cadmium as estimated (J/UJ), with low bias directions assigned. Nickel was qualified in the parent sample only, due to the fact that the %D of 10.6% was marginally in excess of the evaluation criterion of 10%.

Analytes for which there was an indication of a matrix analytical problem related to serial dilutions were qualified as such.

Site-specific field duplicate samples, rinsate blanks, and field blanks were assessed collectively by matrix for the February 2004 Groundwater and Surface Water Sampling Event to determine the need for qualification of sample results of similar matrices. The sections to follow summarize the results for these QC samples and any collective qualifications arising from the assessments.

5.1 FIELD DUPLICATE AGREEMENT

The field duplicate agreement assessment evaluated the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, as follows. When both concentration results were sufficiently greater (5x) the CRDL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤25%. If one or both of the concentration results were less than 5x the CRDL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤2x the CRDL. Again, the frequency of the field duplicate samples followed the frequency of matrix spike and laboratory duplicate analyses, as the same samples were designated for all QC parameters. Table 5.1.1 summarizes the sample sites, which were duplicated and notated as field duplicate samples, per parameter.

The breakdown of field duplicate pair samples per analysis and fraction can be referenced in Table 5.1.2.

Table 5.1.1
Summary of Field Duplicate Samples Collected February 2004

Sample ID	Analyses		
	Total Metals	Dissolved Metals	Inorganics
GROUNDWATER			
HANSEN-T01N/T01D-GRW (WAT264A)	X	X	X
HANSEN-D01N/D01D-GRW (WAT264A)	X	X	X
MMW-30A-T01N/T01D-GRW (WAT264A)	X	X	X
MMW-30A-D01N/D01D-GRW (WAT264A)	X	X	X
SURFACE WATER			
COLUMBINECREEK-T01N/T01D-SFW (WAT265S)	X	X	X
COLUMBINECREEK-D01N/D01D-SFW (WAT265S)	X	X	X

Table 5.1.2
Field Duplicate Collection Frequency for the February 2004 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	2	30	6.0
Dissolved Metals	2	30	6.0
Inorganics	2	30	6.0
SURFACE WATER			
Total Metals	1	4	25.0
Dissolved Metals	1	4	25.0

A total of eight sample results did not meet the criteria specified in SOP 12.1 and therefore were qualified as estimated (J/UJ) with indeterminate bias directions assigned, as summarized in Table 5.1.3. Qualification on the basis of field duplicate disagreement was limited to the parent samples. Based on the FD results, the overall level of precision demonstrated is considered to be acceptable.

Table 5.1.3
Field Duplicate Qualifications Assigned to Parent Samples for the February 2004 Sampling Event

Sample	Analyte	Sample Conc. (mg/kg)	Duplicate Conc. (mg/kg)	RL (mg/kg)	Evaluation Criterion	Criteria Exceedance	Qualification Code
COLUMBINECREEK-T01N/D-SFW	Lead	0.10 U	0.31	0.10	Diff>2xRL	0.21>0.20	J FD-I UJ FD-I
COLUMBINECREEK-D01N/D-SFW	Copper	0.30 U	0.95	0.30		0.65>0.60	
	Manganese	4.2	1.1 U	1.1		3.1>2.2	
HANSEN-D01N/D-GRW	Selenium	7.4	2.0 U	2.0		5.4>4.0	

U = Nondetect

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blanks are prepared in an identical manner to the samples with which they are associated. Table 5.2.1 summarizes the rinsate blank samples associated with the samples collected during the February Groundwater and Surface Water Sampling Event. The QAPP required frequency of 5% for the collection of rinsate blanks was met for the February 2004 sampling event.

Table 5.2.1
Summary of Rinsate Blank Samples Collected February 2004

Sample ID	Metals	Inorganics
GROUNDWATER		
RB01T/D-GRW (WAT263C)	X	X
RB02T/D-GRW (WAT261A)	X	X
Frequency:	6.7%	6.7%
SURFACE WATER		
RB01T/D-SFW (WAT265)S	X	X
Frequency:	25%	25%

Table 5.2.2 summarizes the analytes detected in the associated RI/FS rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered.

Table 5.2.2
Summary of Rinsate Blank Results and Additional Qualifications

Analytes	RL	# Detections	Total # Samples	% Detections	Average Conc. (mg/L)	x5 Criteria (mg/L)	Range for Field Samples (mg/L)	Action
GROUNDWATER- TOTAL FRACTION								
TDS	5.0	1	2	50	5.75	28.8	608-9850	TDS results ≤ 28.8→U RB-I
Balk	1.0	1	2	50	2.5	12.5	All ND	NQ
Talk	1.0	1	2	50	2.5	12.5		
Ammonia	0.040	1	2	50	0.043	0.22		Ammonia result ≤ 0.22→U RB-I
TSS	0.50	1	2	50	0.375	1.88		TSS results ≤ 1.88→U RB-I
SURFACE WATER- TOTAL FRACTION								
TSS	5.0	1	1	100	12.0	60.0	150-326	All sample results less than criterion

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results less than the calculated criteria concentration. In determining the average concentrations, for nondetect values, one half the RL was used to represent the contributing concentration, as opposed to zero, which could potentially bias the average concentration low. Despite the fact that some results were qualified as nondetect on the basis of rinsate blank detections, the rinsate blank results are generally indicative of acceptable decontamination procedures as detections were infrequent and at low levels.

5.3 EVALUATON OF SECONDARY FILTRATION SAMPLE RESULTS

In addition to collecting the standard field QC samples of field duplicates, rinsate blanks, field blanks and trip blanks at a frequency of 1 per 20 field samples per matrix (as applicable to the

analysis parameters) another type of field QC sample was collected during the February 2004 Specialty Sampling Event. For the dissolved lanthanides analysis, a secondary filtration was done on three samples to evaluate adsorption of lanthanides to the filter material.

The laboratory suggested doing adsorbance testing on the filter material to differentiate between filtration and adsorbance in order to have a true dissolved determination of lanthanides. At sites MMW-21, MMW-30A, and MMW-30B, two dissolved metals (lanthanides) aliquots were prepared; the filtered samples were labeled with "D01N" in the field ID. Then, for each location, one of the "D01N" filtrate aliquots was filtered a second time, using a new filter, and the resultant sample was labeled with "D02N" in the field ID. The difference between the results for the D01N samples and the D02N samples were used to provide an indication of the propensity of lanthanide adsorbance on the specific filter media.

To evaluate the magnitude of adsorption of lanthanides on the filter, the ratio between the primary and secondary filtration results (i.e., D01N/D02N) was calculated as shown in the table below.

Analytes	Ratio of D01N to D02N Lanthanide Results		
	MMW-21	MMW-30A	MMW-30B
Cerium	1.00	1.39	1.08
Dysprosium	1.02	1.47	1.04
Erbium	1.02	1.47	1.06
Europium	1.02	1.41	1.07
Gadolinium	1.01	1.45	1.05
Holmium	1.02	1.51	1.04
Lanthanum	1.00	1.40	1.08
Lutetium	1.01	1.33	1.05
Neodymium	1.01	1.35	1.04
Praseodymium	1.00	1.36	1.08
Samarium	1.01	1.37	1.12
Terbium	1.02	1.49	1.03
Thulium	1.00	1.46	1.10
Ytterbium	1.01	1.33	1.01
Yttrium	1.00	1.51	1.03
Average Ratio D01N/D02N	**1.01**	**1.42**	**1.06**

For all three samples, all ratios are 1.00 or greater, as expected, indicating that the D02N results were always less than or equal to the D01N results. For samples MMW-21 and MMW-30B, the average ratio between the D01N and D02N results were 1.01 and 1.06, indicating that while the D02N results were generally lower, the difference was very small (e.g. there was very little adsorption). For sample MMW-30A, however, the average ratio between the D01N and D02N results was 1.42, suggesting that there potentially might be some adsorption of lanthanides on the filter material. However, as no adsorption was indicated for the other two samples, other cause for the difference between the D01N and D02N results for sample MMW-30B were explored.

Field duplicate samples were analyzed at MMW-30A, allowing an evaluation of the sample homogeneity and analysis precision. The RPDs between the dissolved MMW-30A results and its field duplicate ranged up to 55% with the average RPD across all lanthanides being 31%. The ratio of the sample result to the field duplicate sample result averaged 1.38. These results

indicate a fairly large amount of heterogeneity in the MMW-30A sample. This imprecision is about the same magnitude as the differences between the D01N and D02N samples, for which the RPDs ranged up to 41% with the average RPD across all lanthanides being 35% and the average ratio between the D01N and D02N results being 1.42. Thus, the observed differences between the sample which was filtered once (D01N) and that filtered twice (D02N) are nearly identical to the differences noted for the primary field sample and its field duplicate sample. The field duplicate results suggest that the observed differences between the D01N and D02N results for MMW-30A are attributable to sample heterogeneity rather than adsorption of the lanthanides on the filter.

This conclusion is further supported by the turbidity observed for the MMW-30A sample. The turbidity measurement for MMW-30A was 29.2 NTU, much larger than that observed for either MMW-21 (8 NTU) or MMW-30B (7.4 NTU). This makes it much more likely that the MMW-30A aliquots are more likely to be highly heterogeneous than the other two samples. The table below summarizes these data suggesting that in-homogeneity is the likely cause of the difference in the D01N and D02N lanthanide results for sample MW-30A.

	MMW-21	MMW-30A	MMW-30B
Average Ratio of D01N to D02N results	1.01	1.42	1.06
Average Ratio of D01N to D01D results	NA	1.38	NA
Average RPD of D01N to D02N results	1%	35%	6%
Average RPD of D01N to D01D results	NA	31%	NA
Turbidity, NTU	8.0	29.2	7.4
Flow Rate, L/min	0.36	0.27	0.34
Aquifer Type	Bedrock	Alluvium	Colluvium

T01N = total lanthanide sample fraction.
D01N = dissolved lanthanide sample fraction, primary filtration.
D02N = dissolved lanthanide sample fraction, secondary filtration of the T01N sample.
NA = Not applicable because a field duplicate sample was not collected at this location.

Thus, the difference in lanthanide results between the first (D01N) and second filtrations (D02N) generally mirrors the difference between the total lanthanide (T01N) and dissolved (D01N) lanthanide results. With the difference noted for sample MMW-30A likely being attributable to sample in-homogeneity, the comparison of the dissolved lanthanide results for the D01N and D02N is considered to indicate that there was little or no adsorption to the filter material for any of the three sets of samples.

During the February through April 2004 period, additional sampling of wells and springs at the mine site and off-site reference areas was performed that was not originally contained in the Work Plan. At the request of EPA, selected wells were sampled and the samples were analyzed for lead and sulfur isotopes, and lanthanides. The additional sampling was performed to assist in evaluating potential source areas at the mine. At that same time, selected wells, seeps and underground locations were also sampled and analyzed for the stable isotopes of oxygen and hydrogen to evaluate the similarities or dissimilarities in physical processes of water recharging these locations. Several wells and springs were also sampled and analyzed for tritium and helium to estimate the age of the water. These non-routine analyses (i.e., specialty analyses) were performed by three facilities, Frontier Geosciences, Inc., the University of Arizona, and the University of Miami and are discussed in this section as stand-alone packages. The analyses performed by each laboratory are listed in Table 1.3.

These non-routing analyses were not included in the RI/FS because these analyses were not anticipated at the time the QAPP was prepared. As such, the QAPP does not include any evaluation criteria for these analyses. The subsections below summarize the QC samples run by each facility and provide a general usability assessment based on the information provided. As the university laboratories are not set-up to do commercial type analyses, the data presentations from the University of Arizona and the University of Miami were limited mostly to sample results. Although the package from Frontier Geosciences was accompanied by an extensive case narrative, the supporting raw data was not provided, so the review conducted was essentially limited to sample-specific parameters and case narrative comments.

6.1 FRONTIER GEOSCIENCES, INC.

Frontier Geosciences, Inc. (FGS) analyzed thirteen groundwater samples for total lead and lead isotopes on both unfiltered and filtered aliquots and eleven groundwater samples for total and dissolved lanthanides. One field duplicate was submitted for all analyses and one rinsate blank was submitted for total lead, dissolved lead, and total lanthanides. In addition, two reference samples prepared by the USGS were submitted for total lanthanides analysis and three secondary filtration samples were prepared and submitted (discussed in Section 5.3). The frequency of field QC sample collection met the requirements of the QAPP. For the lead isotopes analysis, the laboratory analyzed five replicates of an external standard (NIST 981), and three replicates of four field samples.

Because the analyses performed by FGS were conducted by ICP-MS, the evaluation criteria presented in the QAPP for Method 6020 were used, as applicable. All of the results were deemed usable for meeting project objectives as qualified. Some results were qualified as estimated based on exceeding the linear range of the instrument (6 results), total vs. partial comparisons (4 results), or poor field duplicate agreement (4 results). A single lead result for a filtered sample was qualified as non-detect based on the associated rinsate blank. The data validation review narrative is presented as Attachment 1.6; it concludes that acceptable demonstrations of accuracy and precision were conducted.

6.2 UNIVERSITY OF ARIZONA

Under the direction of Dr. Chris J. Eastoe, the University of Arizona's Department of Geosciences Laboratory of Isotope Geochemistry analyzed selected samples for stable isotopes of water on unfiltered samples and sulfur isotopes on filtered samples.

Stable isotopes of water were measured on 19 groundwater samples and 4 surface water samples. One field duplicate was collected for groundwater (MMW-17B-T01D-GRW) and one field duplicate was collected for surface water (Columbine Creek-T01D-SFW). The ∂^{18}O‰ results for both field duplicate pairs were identical and the ∂^{18}D‰ results differed by approximately the 1-sigma precision limit of 0.9, with results of -97 vs. –98 for both field duplicate pairs. Although not necessary for these analysis parameters, a rinsate blank was done on sampling equipment after one groundwater sample (RB01T-GRW) and after one surface water sample (RB01T-SFW).

Thirteen filtered groundwater samples and one rinsate blank were analyzed for sulfur isotopes. The rinsate blank showed no sulfate. A field duplicate was not collected.

6.3 UNIVERSITY OF MIAMI

Under the direction of Dr. Zafer Top, the University of Miami's Resenstel School of Marine and Atmospheric Science Noble Gas Isotope Laboratory analyzed 17 groundwater samples for helium and tritium. Three field duplicate samples were submitted (MMW-11A-T01D-GRW, MMW-18B-T01D-GRW, and Spring13-T01D-GRW) and the laboratory analyzed two additional samples in duplicate (MMW-29A-T01N-GRW DUP and MMW-30A-T01N-GRW DUP). Analytical results for the environmental sample and duplicates were reported within a similar range and are considered to show acceptable agreement.

All data were considered acceptable for use in meeting project objectives as qualified. Multiple sample results were qualified as nondetect on the basis of laboratory blank or rinsate blank contamination. Others were qualified as estimated on the basis of matrix spike recoveries. Lastly, several data results were qualified as estimated on the basis of holding time exceedances, serial dilution results, one laboratory duplicate disagreement, and one total vs. partial disagreement. The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives.

7.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 7.1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 7.1
Summary of Precision Assessment for February 2004

Analysis Type	QC Measure	# of Measurements	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	FD	24	24	100
	LD	24	24	100
Total metals	FD	50	50	100
	LD	50	50	100
Dissolved Metals	FD	50	48	96
	LD	50	50	100
SURFACE WATER				
Inorganics	FD	5	5	100
	LD	5	4	80
Total Metal	FD	25	23	92
	LD	25	25	100
Dissolved Metals	FD	25	21	84
	LD	25	25	100

The percentage of acceptable precision measurements was 100% for all parameters, with the exception of TSS for groundwater, for which 80% of the laboratory duplicate analyses were within acceptable limits. The overall level of precision demonstrated for all analyses collectively was considered to be acceptable.

7.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. These measurements were expressed as percent recoveries for matrix spike (MS), summarized in Table 7.2. Results for laboratory control samples (LCS) were

not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters.

Table 7.2
Summary of Accuracy Assessment for February 2004

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	MS	12	12	100
Metals	MS	75	69	92
SURFACE WATER				
Inorganics	MS	2	2	100
Metals	MS	42	42	100

The percentage of acceptable accuracy measurements ranged from 92-100%. Arsenic results in dissolved fraction groundwater samples were qualified collectively. The overall level of accuracy with respect to the site matrix demonstrated for all analyses collectively was considered to be acceptable.

7.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results were considered usable as qualified for meeting project objectives. The QAPP completeness goal of 80% was met.

7.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the groundwater and surface water samples collected during the February 2004 sampling event. The close agreement between the field duplicate results, as discussed in Section 5.1, indicated that the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 5.2 indicated that sample processing and subsampling procedures were acceptable.

7.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

7.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analytes. Where possible, the laboratory submitted data from lesser dilutions (for organic analyses), thereby achieving detection limits for non-detects, as specified in the QAPP. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. While it is anticipated that all non-rejected data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT261A Sampling Event: February 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter Date Completed: 05/03/04

Peer Reviewer: Sheri O'Connor Date Completed: 01/06/05

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
MMW-17B-T01N-GRW	SA	561688	W	X	X
MMW-17B-D01N-GRW	SA	561689	W	X	
MMW-21-T01N-GRW	SA	561590	W	X	X
MMW-21-D01N-GRW	SA	561591	W	X	
MMW-22-T01N-GRW	SA	561592	W	X	X
MMW-22-D01N-GRW	SA	561593	W	X	
MMW-11A-T01N-GRW	SA	561594	W	X	X
MMW-11A-D01N-GRW	SA	561595	W	X	
SPRING-13-T01N-GRW	SA	561596	W	X	X
SPRING13-D01N-GRW	SA	561597	W	X	
MMW-45A-T01N-GRW	SA	561698	W	X	X
MMW-45A-D01N-GRW	SA	561699	W	X	
HANSEN-T01N-GRW	SA	561700	W	X	X
HANSEN-D01N-GRW	SA	561701	W	X	
HANSEN-T01D-GRW	FD	561702	W	X	X
HANSEN-D01D-GRW	FD	561703	W	X	
TANK1-T01N-STW	SA	561704	W	X	X
RB02T-GRW	RB	561705	W	X	X
RB02D-GRW	RB	561706	W	X	
MMW-7-T01N-GRW	SA	561707	W	X	X
MMW-7-D01N-GRW	SA	561708	W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

As mentioned in the case narrative, cation/anion balances were calculated for samples HANSEN-T01N-GRW and HANSEN-T01D-GRW only, as not all constituents in the calculation were analyzed for the remaining samples in this delivery group.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, samples MMW-17B-D01N-GRW, MMW-21-D01N-GRW, MMW-22-T/D01N-GRW, SPRING13-T/D01N-GRW, MMW-45A-T/D01N-GRW, HANSEN-T/D01N-GRW and HANSEN-T/D01D-GRW, for the analyses of metals and hardness, were received with a pH greater than 2 and subsequently required the addition of nitric acid to attain the proper pH for preservation. No qualification was necessary for the metal or hardness results for these samples due to the fact that the nitric acid added would have dissolved most of the metals that might have precipitated out. This was further supported by the observation that the diluted metal concentrations were comparable to the total metal concentrations. As noted in the laboratory log-in sheet, sample TANK1-T01N-STW was logged in for Total Suspended Solids (TSS) analysis. The appropriate bottle (W-8) was received, despite the fact that it was not marked on the COC. In addition, samples HANSEN-T01N-GRW, HANSEN-T01D-GRW, and TANK1-T01N-STW were assigned for the full analysis suite per the clients (URS) request at the time of log-in.
Holding Times	No	As mentioned in the laboratory case narrative, the original Total Dissolved Solids (TDS) analysis of sample MMW-7-T01N-GRW was performed within the prescribed analytical holding time of 7 days. However, after drying, this sample yielded a net weight that greatly exceeded the upper limit of the method. Accordingly, this sample was reanalyzed using a smaller sample volume outside of holding time yielding results comparable to the original analysis. As the TDS result form the re-analysis has been formally presented in the case submittal, the result was qualified as estimated (J) HT-I As noted in the case narrative, the original nitrate analyses of the allocated samples in this delivery group were accomplished within the prescribed analytical holding time of 48 hours. However, due to elevated nitrate concentrations in the associated calibration blanks, samples HANSEN-T01N-GRW, HANSEN-T01D-GRW, and TANK1-T01N-STW required re-analyses, which were accomplished one day beyond the holding time. As such, nitrate results for all three samples were qualified as estimated (J) HT-I. In addition, the nitrite results for these three samples were accomplished several hours beyond the analytical holding time of 48 hours. Accordingly, as all nitrite results were nondetect, all were qualified as estimated (UJ) HT-I. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for the three relevant samples were taken eight days after sampling and six days beyond log-in. The pH for the same three samples were measured approximately three hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD MMW-11A-T01N-GRWMS MMW-11A-D01N-GRWMS • PDS MMW-11A-T01N-GRWA MMW-11A-D01N-GRWA • LD MMW-11A-T01N-GRWD MMW-11A-D01N-GRWD	No	Several analytes were recovered outside of the acceptance range of 75-125%. The iron matrix spike recoveries for both matrix spike samples were not appropriate for assessing accuracy because the iron sample results were greater four times the spike amount. Table 1-3 summarizes the matrix spike recoveries outside the acceptance limits and resultant qualifications. Post digestion spikes recoveries were reviewed for the metal analytes that did not meet the specified criterion for the initial matrix spike recoveries. As all post digestion spike recoveries for these analytes were recovered within acceptance limits, no data qualification was necessary on the basis of PDS recoveries. All laboratory duplicates satisfied the QAPP concentration-dependent evaluation criterion. Therefore, data qualification was not necessary. The matrix quality control results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (A) MMW-11A-T01N-GRW MMW-11A-D01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses run on samples MMW-11A-T01N-GRW and MMW-11A-D01N-GRW were applicable for only one analyte (manganese) out of 24 metal analytes. Only manganese exhibited initial sample concentrations sufficiently larger (50x) than the IDL, adjusted for dilution. As both samples reported percent differences for manganese below 10%, no qualification of data was necessary on the basis of serial dilution results. The serial dilution results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification of data was considered necessary on the basis of TDS ratios. The internal standard recoveries of ^{89}Y were greater than the acceptance limits for the ICP/MS analyses of samples MMW-22-D01N-GRW, MMW-7-T01N-GRW, and MMW-7-D01N-GRW. The analytes associated with this internal standard, (beryllium, molybdenum, and selenium) were reported from the trace ICP. The trace ICP reporting limits for the afore-mentioned analytes met the requirements of the QAPP such that the change in instrumentation did not affect the usability of the data. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate HANSEN-T01N/T01D-GRW HANSEN-D01N/D01D-GRW • Rinsate Blank RB02T-GRW RB02D-GRW • Field Blank • Trip Blank	No	Field duplicate samples were assessed for overall precision of the analyses. Selenium results were qualified as estimated (UJ/J) in the field duplicate pair samples HANSEN-D01N-GRW and HANSEN-D01D-GRW, as the criteria set forth in the QAPP was not met for these results. An indeterminate bias direction was assigned to the selenium sample results qualified. The field QC results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.
Laboratory Performance Parameters	Complete with "Yes", "No", or "N/A".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Yes	For the ICP/MS analyses, information regarding the mass calibration and resolution are not available due to the software limitations. However, acceptable performance can be inferred from the other QC sample results, which satisfied evaluation criteria. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported contained concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not considered necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Cond. (µmhos/cm)	PH (std units)	TDS (mg/L)
HANSEN-T01N-GRW	0.23 J	0.0050 UJ	2380 J	4.3 J	---
HANSEN-T01D-GRW	0.23 J	0.0050 UJ	2370 J	4.0 J	---
TANK1-T01N-STW	0.96 J	0.0050 UJ	2110 J	6.4 J	---
MMW-7-T01N-GRW	---	---	---	---	9390 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P)	---	-0.5	-0.5	-0.4	-0.5	-0.477	0.3	HANSEN-D01D-GRW HANSEN-D01N-GRW HANSEN-T01D-GRW HANSEN-T01N-GRW MMW-11A-D01N-GRW MMW-11A-T01N-GRW MMW-17B-D01N-GRW MMW-17B-T01N-GRW RB02D-GRW RB02T-GRW SPRING-13-D01N-GRW SPRING-13-T01N-GRW TANK1-T01N-SFW	J/UJ MB,CCB-L
Lead (MS)	0.1	0.1	0.1	0.1	0.1	1.6	0.10	All samples were qualified	U MB,CCB-I U MB-I
Selenium (MS)	---	---	---	---	---	-3.155	0.2	All samples were qualified	J/UJ MB-L
Sodium (P)	-564.5	-581.6	---	-550.5	---	---	490.0	All samples were qualified	J/UJ CCB-L
Thallium (MS)	0.2	0.2	0.2	0.2	0.2	1.709	0.10	All samples were qualified	U MB,CCB-I
Vanadium (MS)	0.2	0.2	0.2	0.2	0.2	1.970	0.10	All samples were qualified with the exception of: MMW-7-D01N-GRW MMW-7-T01N-GRW	U MB,CCB-I

MS = Mass Spectroscopy P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	% MS	PDS %R	Criteria	Action
MMW-11A-T01N-GRW				
Cadmium	159.2	106.9	75-125%	NQ (ND)
Cobalt	129.9	107.2		NQ (ND)
Iron	0.0	112.6		NA→NQ
MMW-11A-D01N-GRW				
Arsenic	130.4	107.6	75-125%	NQ (ND)
Cadmium	140.2	104.5		NQ (ND)
Iron	0.0	111.1		NA→NQ

NQ (ND) = No Qualification necessary for a nondetect result with a high bias

NA→NQ = No Qualification necessary as the matrix spike result was not applicable (sample results were greater than four times the spike amount).

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT262A

Sampling Event: February 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 05/03/04

Peer Reviewer: Sheri O'Connor

Date Completed: 01/06/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
LABOBITA-T01N-GRW	SA	561757	W	X	X
LABOBITA-D01N-GRW	SA	561758	W	X	
MMW-39A-T01N-GRW	SA	561759	W	X	X
MMW-39A-D01N-GRW	SA	561760	W	X	
MMW-38A-T01N-GRW	SA	561761	W	X	X
MMW-38A-D01N-GRW	SA	561762	W	X	
MMW-28B-T01N-GRW	SA	561763	W	X	X
MMW-28B-D01N-GRW	SA	561764	W	X	
MMW-24-T01N-GRW	SA	561765	W	X	X
MMW-24-D01N-GRW	SA	561766	W	X	
MMW-36B-T01N-GRW	SA	561767	W	X	X
MMW-36B-D01N-GRW	SA	561768	W	X	
MMW-44A-T01N-GRW	SA	561769	W	X	X
MMW-44A-D01N-GRW	SA	561770	W	X	

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

As mentioned in the case narrative, a cation/anion balance was calculated for sample LABOBITA-T01N-GRW only, as not all constituents in the calculation were analyzed for the remaining samples in this delivery group.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. The conductivity measurement for the one relevant sample (LABOBITA-T01N-GRW) was taken seven days after sampling and five days beyond log-in. The pH for the same relevant sample was measured approximately five hours beyond log-in. Therefore, the conductivity and pH results for sample LABOBITA-T01N-GRW were qualified as estimated (J), with an indeterminate bias direction was assigned.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD LABOBITA-T01N-GRWMS LABOBITA-D01N-GRWMS • PDS LABOBITA-T01N-GRWA LABOBITA-D01N-GRWA • LD LABOBITA-T01N-GRWD LABOBITA-D01N-GRWD	N/A	Several analytes were recovered outside of the acceptance range of 75-125%. The iron matrix spike recoveries for both matrix spike samples were not appropriate for assessing accuracy because the iron sample results were greater four times the spike amount. Table 1-3 summarizes the matrix spike recoveries outside the acceptance limits and resultant qualifications. Post digestion spikes recoveries were reviewed for the metal analytes that did not meet the specified criterion for the initial matrix spike recoveries. As all post digestion spike recoveries for these analytes were recovered within acceptance limits, no data qualification was necessary on the basis of PDS recoveries. All laboratory duplicates satisfied the QAPP concentration-dependent evaluation criterion. There data qualification was not necessary. The matrix quality control results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (A) LABOBITA-T01N-GRWSL LABOBITA-D01N-GRWSL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses run on samples LABOBITA-T01N-GRW and LABOBITA-D01N-GRW were applicable for only one analyte (barium) out of 24 metal analytes. Only barium exhibited initial sample concentrations sufficiently larger (50x) than the IDL, adjusted for dilution. As both samples reported percent differences in excess of 10% (15.1%, and 20.2%, respectively). As the diluted results for both samples (considered to be the more accurate of the two) were lower than the initial results, the bias direction assigned was high. As both barium results were nondetect, no qualification was necessary. The serial dilution results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. For samples MMW-39A-T/D01N-GRW, the analysis of dissolved chromium resulted in a concentration of 159 ug/L, which exceeded that of the total concentration, 110 ug/L, beyond variation expected due to the accuracy limitations of the method. Therefore, the total and dissolved chromium results for these two samples were qualified as estimated UJ/J TvP-I. The laboratory-generated cation/anion balances was compared against an evaluation criterion of ±13% to assess the usability of data. The reported cation/anion balance for LABOBITA-T01N-GRW met this criterion. No qualification of data in this delivery group was considered necessary on the basis of cation/anion imbalances. The ratios of the calculated versus measured TDS for the same field sample, LABOBITA-T01N-GRW was within 0.5 and 1.5. No qualification of data was considered necessary on the basis of TDS ratios. The internal standard recoveries of ^{89}Y were elevated for the ICPMS analyses of samples MMW-39A-T01N-GRW, MMW-39A-D01N-GRW, MMW-38A-D01N-GRW, MMW-38A-T01N-GRW, and MMW-44A-D01N-GRW. The analytes associated with this internal standard, (beryllium, molybdenum, and

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		selenium) were reported from the trace ICP. The trace ICP reporting limits for the afore-mentioned analytes met the requirements of the QAPP such that the change in instrumentation did not affect the usability of the data. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank		No field QC samples were analyzed with this data package. The field QC results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Arsenic (P)	---	4.2	---	---	---	2.8	MMW-24-T01N-GRW MMW-38A-D01N-GRW MMW-38A-T01N-GRW MMW-39A-D01N-GRW MMW-39A-T01N-GRW	U CCB-I
Lead (MS)	0.1	0.1	0.1	---	1.39	0.10	LABOBITA-D01N-GWR LABOBITA-T01N-GRW MMW-24-D01N-GRW MMW-24-T01N-GRW MMW-28B-D01N-GRW MMW-28B-T01N-GRW MMW-36B-D01N-GRW MMW-36B-T01N-GRW MMW-38A-D01N-GRW MMW-38A-T01N-GRW MMW-44A-D01N-GRW MMW-44A-T01N-GRW	U MB,CCB-I U MB-I
Nickel (MS)	---	3.0	---	---	---	2.7	MMW-24-D01N-GRW MMW-24-D01N-GRW	U CCB-I
Selenium (MS)	---	0.3	---	0.4	---	0.2	MMW-36B-D01N-GRW MMW-36B-T01N-GRW MMW-44A-D01N-GRW MMW-44A-T01N-GRW	U CCB-I U MB-I
Thallium (MS)	0.2	0.2	0.2	0.2	1.704	0.10	All samples were qualified	U MB,CCB-I
Vanadium (MS)	0.4	0.4	0.5	0.4	4.368	0.10	All samples were qualified	U MB,CCB-I U MB-I

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike Results and Parent Sample Qualifications

Analyte	% MS	PDS %R	Criteria	Action
LABOBITA-D01N-GRW				
Iron	0.0	108.7	75-125%	NA→ NQ
Nickel	131.6	107.0		ND (NQ)
LABOBITA-T01N-GRW				
Cadmium	74.2	103.5	75-125%	UJ MS-L
Iron	0.0	107.8		NA→NQ

NQ (ND) = No Qualification necessary for a nondetect result with a high bias

NA→NQ = No Qualification necessary as the matrix spike result was not applicable, (as sample results were greater than four times the spike amount).

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT263C Sampling Event: February 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 05/04/04

Peer Reviewer: Sheri O'Connor Date Completed: 01/06/05

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
RB01T-GRW	RB	561807	W	X	X
RB01D-GRW	RB	561808	W	X	
MMW-28A-T01N-GRW	SA	561809	W	X	X
MMW-28A-D01N-GRW	SA	561810	W	X	
MMW-30B-T01N-GRW	SA	561880	W	X	X
MMW-30B-D01N-GRW	SA	561881	W	X	
MMW-29B-T01N-GRW	SA	561882	W	X	X
MMW-29B-D01N-GRW	SA	561883	W	X	
AWWT-2-T01N-GRW	SA	561884	W	X	X
AWWT-2-D01N-GRW	SA	561885	W	X	
SC-8A-T01N-GRW	SA	562069	W	X	X
SC-8A-D01N-GRW	SA	562070	W	X	
MMW-2-T01N-GRW	SA	562071	W	X	X
MMW-2-D01N-GRW	SA	562072	W	X	
SC-1B-T01N-GRW	SA	562073	W	X	X
SC-1B-D01N-GRW	SA	562074	W	X	
CC-2A-T01N-GRW	SA	562075	W	X	X
CC-2A-D01N-GRW	SA	562076	W	X	X

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

As mentioned in the case narrative, cation/anion balances were calculated for samples AWWT-2-T01N-GRW, AWWT-2-D01N-GRW, and RB01T-GRW only, as not all constituents in the calculation were analyzed for the remaining samples in this delivery group.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The sample preservation document noted that upon log-in, samples SC-1B-T01N-GRW and SC-1B-D01N-GRW, for the analyses of metals, were received with a pH greater than 2 and subsequently required the addition of nitric acid to attain the proper pH for preservation. No qualification was necessary for the metal or hardness results for these samples due to the fact that the nitric acid added would have dissolved most of the metals that might have precipitated out. This was further supported by the observation that the diluted metal concentrations were comparable to the total metal concentrations. This document further notes that sample AWWT-2-T01N-GRW for cyanide analysis was received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect result for this sample was qualified as estimated (UJ), with an indeterminate bias direction. The laboratory log-in sheet noted that only one TOC vial was received for sample RB01. Enough volume was received to sufficiently analyze RB01T-GRW for TOC.
Holding Times	No	The orthophosphate result for sample AWWT-2-T01N-GRW was qualified as estimated (UJ) HT-I, as the analysis was performed several hours beyond the prescribed analytical holding time of 48 hours. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for the two relevant samples (RB01T-GRW and AWWT-2-T01N-GRW)were taken six to seven days after sampling and four to five days beyond log-in. The pH for the same two samples was measured between 3.5 to 5 hours beyond log-in. Therefore, the conductivity and pH results for these two samples were qualified as estimated (J). An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) MMW-30B-T01N-GRWL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analysis run on sample MMW-30B-T01N-GRW was applicable for only two analytes (boron, and calcium) out of 24 metal analytes. Only boron and calcium exhibited initial sample concentrations sufficiently larger (50x) than the IDL, adjusted for dilution. As this sample reported both percent differences for these two analytes below 10% (5.2% and 0.2%, respectively), no qualification of data was necessary on the basis of serial dilution results. The serial dilution results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion with the exception of sample RB01T/D01N-GRW, with a percent difference of reported a 51.66%. As verified independently, the concentrations in this rinsate blank sample were low enough that the reporting limits controlled the calculations. The balance was therefore not an appropriate measure of accuracy. No qualification of data in this delivery group was considered necessary on the basis of cation/anion imbalances. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5, with the exception of RB01T/D01N-GRW, which reported

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		a TDS ratio of 2.82. The TDS measured concentration for this sample was 9 mg/L, while the TDS calculated value was 25 mg/L. The TDS calculated value was inflated due to nondetect ion concentrations calculated at the reporting limits. No qualification of data was considered necessary on the basis of TDS ratios. The internal standard recoveries of ^{89}Y were elevated for the ICPMS analyses of samples MMW-2-T01N-GRW and MMW-2-D01N-GRW. The analytes associated with this internal standard, (beryllium, molybdenum, and selenium) were reported from the trace ICP. The trace ICP reporting limits for the afore mentioned analytes met the requirements of the QAPP such that the change in instrumentation did not affect the usability of the data. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate • Rinsate Blank RB01T-GRW RB01D-GRW • Field Blank • Trip Blank	Yes	The field QC results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	0.50	0.50	0.50	0.50	0.978	0.20	All samples were qualified	U MB,CCB-I
Arsenic (MS)	---	---	0.10	---	---	0.20	CC-2A-T01N-GRW MMW-28A-T01N-GRW SC-1B-D01N-GRW SC-1B-T01N-GRW SC-8A-T01N-GRW	U CCB-I
Nickel (P)	---	---	---	3.6	---	2.4	CC-2A-D01N-GRW	U CCB-I
Selenium (MS)	---	-0.30	0.30	-0.30	-0.576	0.20	All samples were qualified with the **exception** of: MMW-2-T01N-GRW	J MB,CCB-L UJ MB,CCB-L

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT264A Sampling Event: February 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 05/04/04

Peer Reviewer: Sheri O'Connor Date Completed: 01/06/05

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Matrix	Analyses	
				Metals	Inorganic
MMW-30A-T01N-GRW	SA	561917	W	X	X
MMW-30A-D01N-GRW	SA	561918	W	X	
MMW-30A-T01D-GRW	FD	561919	W	X	X
MMW-30A-D01D-GRW	FD	561920	W	X	
MMW-29A-T01N-GRW	SA	561921	W	X	X
MMW-29A-D01N-GRW	SA	561922	W	X	
AWWT-1-T01N-GRW	SA	561923	W	X	X
AWWT-1-D01N-GRW	SA	561924	W	X	
SC-1A-T01N-GRW	SA	562097	W	X	X
SC-1A-T01N-GRW	SA	562098	W	X	
MMW-23A-T01N-GRW	SA	562099	W	X	X
MMW-23A-D01N-GRW	SA	562100	W	X	
HAUT-N-TAUT-T01N-GRW	SA	562227	W	X	X
HAUT-N-TAUT-D01N-GRW	SA	562228	W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with Matrix

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

As mentioned in the case narrative, cation/anion balances were calculated for samples AWWT-I-T/DOINGRW and HAUT-N-TAUT-T/DOIN-GRW only, as not all constituents in the calculation were analyzed for the remaining samples in this delivery group.

The laboratory case narrative noted that during the chloride analyses of 03/01/04 and 03/02/04, the associated calibration blanks exhibited concentrations in excess of the reporting limit (0.20 mg/L). The chloride results for the associated field samples (AWWT-1-T01N-GRW and HAUT-N-TAUT-T01N-

GRW) were reported at concentrations in excess of 10x the blank concentration. This did not affect the quality or usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	As noted in the laboratory case narrative, the original nitrate analysis of sample HAUT-N-TAUT-T0IN-GRW was accomplished within the prescribed analytical holding time of 48 hours (on the day it was received). However, due to an oversight by the analyst, a closing calibration blank was not analyzed for the analytical sequence. Accordingly, this sample was reanalyzed yielding acceptable results, two days beyond the prescribed holding time. As the results from the re-analysis were formally presented, the nitrate result for this sample was qualified as estimated (UJ). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for the two relevant samples (AWWT-I-T0IN-GRW and HAUT-N-TAUT-GRW) were taken six to eight days after sampling and four to six days beyond log-in. The pH for the same two samples was measured approximately 3.5 to 5 hours beyond log-in. Therefore, the conductivity and pH results for these two samples were qualified as estimated (J). An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Aluminum, iron, and selenium were detected in the metal preparation blank and continuing calibration blanks. As all sample results for aluminum and iron were either nondetect or sufficiently higher (>5x) than the blank detections, no qualification was necessary for these analyte results. All sample results for selenium were qualified as estimated (J/UJ) CCB-L (a low bias direction was assigned, as the selenium concentration in the blank was negative).
Matrix QC • MS/MSD • PDS • LD	N/A	This package did not include any site-specific matrix quality control samples The matrix quality control results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (A) MMW-30A-T01N-GRW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analysis run on sample MMW-30A-T0IN-GRW was applicable for only one analyte (manganese) out of 24 metal analytes. Only manganese exhibited initial sample concentrations sufficiently larger (50x) than the IDL, adjusted for dilution. As the reported percent differences for manganese was below 10% (3.8%), no qualification of data was necessary on the basis of serial dilution results. The serial dilution results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The selenium concentration of 4.3 µg/L in the filtrate (dissolved) sample MMW-23A-D01N-GRW was greater than the selenium concentration of 3.0 µg/L in the corresponding total metals sample, MMW23A-T01N-GRW. Due to the fact that both values were greater than 5x the RL (0.30 µg/L), the agreement of the two concentrations was compared to an evaluation criterion of ± 30%. As the partial concentration exceeded the total by 30.2%, no qualification of data was considered necessary, as this percentage rounded to 30%, within the acceptance range specified in SOP 12.1. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. No qualification of data in this delivery group was considered necessary on the basis of cation/anion imbalances.

Review Parameter	Criteria Met?	Comments
		The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification of data was considered necessary on the basis of TDS ratios. The internal standard recoveries of ^{89}Y were elevated for the ICPMS analyses of samples MMW-23-T0IN-GRW and MMW-23A-D0IN-GRW. The analytes associated with this internal standard, (beryllium, molybdenum, and selenium) were reported from the trace ICP. The trace ICP reporting limits for the afore mentioned analytes met the requirements of the QAPP such that the change in instrumentation did not affect the usability of the data. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC • Field Duplicate MMW-30A-T01N/T01D-GRW MMW-30A-D01N/D01D-GRW • Rinsate Blank • Field Blank • Trip Blank	No	Field duplicate samples were assessed for overall precision of the analyses. As both field duplicate pairs met the criteria set forth in the QAPP, no qualification of data was necessary on the basis of field duplicate disagreement. The field QC results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT265S

Sampling Event: February 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter

Date Completed: 07/06/04

Peer Reviewer: Sheri O'Connor

Date Completed: 01/06/05

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganic
RR-7-T01N-SFW	SA	561953		W	X	X
RR-7-D01N-SFW	SA	561954		W	X	
COLUMBINE CREEK-T01N-SFW	SA	561955	COLUMBINECRK-T01N-SFW	W	X	X
COLUMBINE CREEK-D01N-SFW	SA	561856	COLUMBINECRK-D01N-SFW	W	X	
COLUMBINE CREEK-T01D-SFW	FD	561857	COLUMBINECRK-T01D-SFW	W	X	X
COLUMBINE CREEK-D01D-SFW	FD	561858	COLUMBINECRK-D01D-SFW	W	X	
RB01T-SFW	RB	561859		W	X	X
RB01D-SFW	RB	561860		W	X	
RR-14-T01N-SFW	SA	561861		W	X	X
RR-14-D01N-SFW	SA	561862		W	X	
RR-10-T01N-SFW	SA	561863		W	X	X
RR-10-D01N-SFW	SA	561964		W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with Matrix

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

As noted in the laboratory case narrative, anion/cation balances were not calculated for any of the samples in this delivery group, as not all the constituents, necessary for the calculation, were analyzed.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD RR-7-T01N-GRWMS RR-7-D01N-GRWMS • PDS RR-7-T01N-GRWA RR-7-D01N-GRWA • LD RR-7-T01N-GRWD RR-7-D01N-GRWD	N/A	All matrix spike recoveries for metal analytes were recovered within the prescribed acceptance range. As such, none of results for metal analytes in either of the two parent samples were qualified on the basis of matrix spike recoveries. All laboratory duplicates satisfied the QAPP concentration-dependent evaluation criterion. Therefore, data qualification was not necessary. The matrix quality control results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-7-T01N-SFW RR-7-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses on matrix spike samples RR-7-T01N-SFW and RR-7-D01N-SFW were applicable for all 24 metal analytes, with the exception of potassium, as all other initial sample results were sufficiently larger (50x) than the IDL. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. Table 1.2 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The serial dilution results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment.
Field QC • Field Duplicate COLUMBINE CREEK-T01N/T01D-GRW COLUMBINE CREEK-D01N/D01D-GRW • Rinsate Blank • Field Blank • Trip Blank	No	Field duplicate samples were assessed for overall precision of the analyses. Several sample results did not meet the criteria as set forth in SOP 12.1 for field duplicates, as summarized in Table 1.3. The field QC results for the February 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	-0.4	-0.4	-0.5	-0.5	-0.531	0.20	All sample results were qualified.	UJ MB,CCB-L
Chromium (P)	-3.2	-3.1	-3.0	-2.8	-2.807	1.5		UJ MB,CCB-L
Copper (P)	-1.3	-1.2	-1.3	-1.3	-1.056	0.30	COLUMBINECREEK-D01D-SFW COLUMBINECREEK-D01N-SFW COLUMBINECREEK-T01D-SFW COLUMBINECREEK-T01N-SFW RB01D-SFW RB01T-SFW RR-10-D01N-SFW RR-7-D01N-SFW	J MB,CCB-L UJ MB,CCB-L
Iron (P)	---	---	---	47.3	---	35.7	RR-10-T01N-SFW	U CCB-I
Lead (P)	---	---	-0.1	-0.1	---	0.1	All sample results were qualified with the **exception** of: RR-7-D01N-SFW RR-7-T01N-SFW	UJ CCB-L J CCB-L
Nickel (P)	-0.9	-1.1	-1.2	-1.2	-0.838	0.20	COLUMBINECREEK-D01D-SFW COLUMBINECREEK-D01N-SFW COLUMBINECREEK-T01D-SFW COLUMBINECREEK-T01N-SFW RB01D-SFW RB01T-SFW	UJ MB,CCB-L
Selenium (MS)	0.5	---	0.7	0.4	---	0.2	All sample results were qualified with the **exception** of: COLUMBINECREEK-T01N-SFW RB01D-SFW	U CCB-I
Silver (MS)	-0.2	-0.2	-0.2	-0.2	-0.223	0.10	All sample results were qualified.	UJ MB,CCB-L
Vanadium (MS)	-0.1	-0.1	-0.2	-0.2	-0.202	0.1		UJ MB,CCB-L

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
RR-7-T01N-SFW		
Selenium	18.0	J DL-L
RR-7-D01N-SFW		
Cadmium	14.4	J DL-L
Nickel	10.6	

Table 1.3
Field Duplicate Qualifications Assigned to Parent Samples

Sample	Analyte	Sample Conc. (mg/Kg)	Duplicate Conc. (mg/Kg)	RL (mg/Kg)	Evaluation Criterion	Criteria Exceedance	Qualification Code
COLUMBINECREEK-T01N/D-SFW	Lead	0.10 U	0.31	0.10	Diff>2xRL	0.21>0.20	J FD-I
COLUMBINECREEK-D01N/D0SFW	Copper	0.30 U	0.95	0.30		0.65>0.60	UJ FD-I
	Manganese	4.2	1.1 U	1.1		3.1>2.2	

U = Nondetect

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT266A

Sampling Event: 2004 MMW-50A Installation

Matrix: Solid ___ Water X Biota ___

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Jennifer Winnike

Date Completed: 05/27/04

Peer Reviewer: Stacey Coker

Date Completed: 05/30/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID[2]	Laboratory Form Field ID Abbreviation [3]	Matrix	Analyses	
					Metals	Inorganic
MMW-50A-T01N-GRW	SA	562871		W	X	X
MMW-50A-D01N-GRW	SA	562872		W	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding times for pH and conductivity analyses were exceeded by 2 and 14 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Boron, chromium, nickel, sodium, silver and vanadium and were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD LD	No	This package did not include any site specific matrix quality control samples. The matrix quality control sample results for this event will be evaluated collectively and any additional qualification assigned will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC Surrogates Serial Dilution MMW-50A-T01N-GRW Internal Standards Total vs. Partial Analyses Cation/Anion Balance	Yes	The serial dilution analysis conducted on sample MMW-50A-T01N-GRW was not applicable for 23 of the 24 metal analytes, as only one analyte exhibited an initial concentration in excess of 50 times the IDL. The percent difference between the original result and it's five fold dilution was compared to an evaluation criterion of $\leq$ 10%. All results were within evaluation criteria, therefore, no qualifications of data were necessary. The laboratory-generated cation/ anion balances were compared against an evaluation criterion of ± 13% to assess the usability of the data. All reported cation/ anion balances met this criterion and therefore did not require qualification. The ratios of the calculated TDS for all field samples were within 0.5 and 1.5.
Field QC Field Duplicate (FD) Rinsate Blank (RB)	Yes	This package did not include any field quality control samples. The field quality control sample results for this event will be evaluated collectively and any additional qualification assigned will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.
Review Parameter	**Criteria Met?**	**Comments**
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	N/A	

Review Parameter	Criteria Met?	Comments
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. Acceptable performance is inferred from ongoing acceptable QC sample results.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Conductivity (umhos/cm)	pH
MMW-50A-T01N-GRW	1020 J	4.6 J

Table 1.2
Metals Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Chromium DF=-100	-2.6	-2.9	---	-1.822		MMW-50A-T01N-GRW MMW-50A-D01N-GRW	UJ CCB, MB-L
Nickel DF=100	-3.7	-3.5	---	-4.263		MMW-50A-T01N-GRW MMW-50A-D01N-GRW	UJ CCB, MB-L
Sodium DF=100	-738.7	-637.1	---	-670.3		MMW-50A-T01N-GRW MMW-50A-D01N-GRW	UJ CCB, MB-L
Silver DF=1	-0.4	-0.4	-0.4	-4.403		MMW-50A-T01N-GRW MMW-50A-D01N-GRW	UJ CCB, MB-L
Vanadium DF=10	0.3	0.3	0.3	2.901		MMW-50A-T01N-GRW MMW-50A-D01N-GRW	U CCB, MB-I

P=ICP MB=Method Blank CCBx=Continuing Calibration Blank IDL=Instrument Detection Limit RL=Reporting Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: N/A

Sampling Event: February 2004 Specialty Sampling Event

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike

Date Completed: 08/10/04

Peer Reviewer: Stacey Coker

Date Completed: 08/10/04

The table below summarizes the results presented in this data package submitted by Frontier Geosciences, Inc.

Field ID [1]	QC Type	Matrix	Analyses		
			Lanthanides	Total Lead	Lead Isotopes
SC-1A-T01N-GRW	SA	W		X	X
SC-1A-D01N-GRW	SA	W		X	X
MMW-7-T01N-GRW	SA	W	X	X	X
MMW-7-D01N-GRW	SA	W	X	X	X
MMW-11A-T01N-GRW	SA	W	X	X	X
MMW-11A-D01N-GRW	SA	W	X	X	X
MMW-21-T01N-GRW	SA	W	X		
MMW-21-D01N-GRW	SA	W	X		
MMW-21-D02N-GRW	SA[2]	W	X		
MMW-23A-T01N-GRW	SA	W	X		X
MMW-23A-D01N-GRW	SA	W	X		X
MMW-29A-T01N-GRW	SA	W		X	X
MMW-29A-D01N-GRW	SA	W		X	X
MMW-30A-T01N-GRW	SA	W	X	X	X
MMW-30A-D01N-GRW	SA	W	X	X	X
MMW-30A-D02N-GRW	SA[2]	W	X		
MMW-30A-T01D-GRW	FD	W	X	X	X
MMW-30A-D01D-GRW	FD	W	X	X	X
MMW-36B-T01N-GRW	SA	W	X	X	X
MMW-36B-D01N-GRW	SA	W	X	X	X
MMW-38A-T01N-GRW	SA	W	X	X	X
MMW-38A-D01N-GRW	SA	W	X	X	X
MMW-39A-T01N-GRW	SA	W	X	X	X
MMW-39A-D01N-GRW	SA	W	X	X	X
MMW-44A-T01N-GRW	SA	W		X	X
MMW-44A-D01N-GRW	SA	W		X	X
MMW-45A-T01N-GRW	SA	W	X	X	X
MMW-45A-D01N-GRW	SA	W	X	X	X
SPRING13-T01N-GRW	SA	W		X	X

Field ID [1]	QC Type	Matrix	Analyses		
			Lanthanides	Total Lead	Lead Isotopes
SPRING13-D01N-GRW	SA	W		X	X
CC-2A-T01N-GRW	SA	W		X	X
CC-2A-D01N-GRW	SA	W		X	X
MMW-2-T01N-GRW	SA	W		X	X
MMW-2-D01N-GRW	SA	W		X	X
MMW-30B-T01N-GRW	SA	W	X		
MMW-30B-D01N-GRW	SA	W	X		
MMW-30B-D02N-GRW	SA[2]	W	X		
RB02T-GRW	RB	W	X	X	
RB02D-GRW	RB	W		X	
PPREE1[3]	SA	W	X		
SCREE1[3]	SA	W	X		

Matrix: W = Water
QC Type: SA = Sample FD = Field Duplicate RB = Rinsate blank
The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2] Secondary filtration; an aliquot of the "D01N" sample was filtered a second time resulting in the "D02N" sample.
[3] Performance evaluation sample collected and characterized by USGS; URS obtained samples from USGS.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

The samples collected for this event were non-routine and were analyzed for non-routine parameters (i.e., parameters not specified in the RI/FS QAPP). The samples were analyzed by Frontier Geosciences, Seattle, WA 98109.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative indicated the Y, Ce, La, and Nd concentrations for a few of the samples exceeded the range of the calibration curve. The samples yielding suspect results were reanalyzed on March 20, 2004 for confirmation purposes. All sample results exceeding the calibration curve were confirmed, therefore only the initial results were reported. The Y, Ce, and Nd results for samples MMW-38A-T01N-GRW and MMW-38A-DO1N-GRW and the Ce results for samples MMW-39A-T01N-GRW and MMW-39A-D01N-GRW were qualified as estimated (J LR-I) because the samples were not analyzed at a dilution to bring the measured concentrations into calibration range.

All ICPMS results (lanthanides and total lead) were blank corrected for the instrument blank and method blank. While this is a non-standard practice in the commercial laboratory industry, it was determined that the results were essentially unaffected by the blank correction. For the lanthanides, the highest blank concentrations accounted for 0.21% to 2.63% of the lowest reported sample concentrations. For the total lead analysis, the highest blank concentration (0.002 ug/l) accounted for 5.71% of the lowest sample result (0.033 ug/l). As such, the results were accepted without qualification or reprocessing.

For the lead isotope analysis, all results were corrected for the results obtained for the standard reference material analyzed, NIST981. The standard reference material NIST-981 was analyzed in order to identify instrument bias prior to sample analysis. This reference material is a sample of pure lead sample. The calculated instrument bias (difference between the certified values and actual) was applied to all sample results. The reason for the correction is to compensate for the electronics of the analytical system because

the lead isotope ratios for the reference material are known true quantities and any difference from the true amounts can be attributed to the analytical system. As all results were corrected for the ratio found in NIST-981, data qualification was not necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	On March 27, 2004 the laboratory was instructed not to analyzed samples RB02T-GRW and RB02D-GRW for lead isotopic ratio testing. No qualifications of data were necessary.
Holding Times	Yes	
Method Blanks	Yes	As noted in the case narrative, all ICPMS sample results were instrument and preparation blank corrected. As the blank concentrations minimally affected reported sample concentrations, data qualification was not issued to the ICPMS sample results.
Matrix QC MS/MSD LD	N/A	Matrix QC samples were not analyzed with this SDG. The overall level of precision and accuracy based on the analytical system and the sample matrix demonstrated for all analyses was considered to be acceptable.
Method QC • Surrogates • Serial Dilution • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards • Check samples PREE1 (aqueous) SCREE1 (aqueous) NIST-2710 (solid) NIST-2711 (solid) NIST981 (Pb ratios)	Yes	There were two standard reference samples submitted and analyzed for the lanthanides analysis, PREE1 and SCREE1. All results were within the specified limits. No qualifications of data were necessary. For the samples SPRING13-T01N-GRW and SPRING13-D01N-GRW, the dissolved lead result (7.52 µg/L) was significantly higher than the total lead result (0.681 µg/L). Although it is suspected that the sample labels were inadvertently switched either in the field or in the laboratory, there are no other metals results for this sample to compare to confirm this. Therefore the lead results for samples SPRING13-T01N-GRW and SPRING13-D01N-GRW were qualified as estimated (**J TVP-I**).
Field QC • Field Duplicate MMW-30A-T01N/T01D-GRW MMW-30A-D01N/D01D-GRW • Rinsate Blank RB02T-GRW RB02D-GRW • Field Blank • Trip Blank • Secondary Filtration MMW-21-D02N-GRW MMW-30A-D02N-GRW MMW-30B-D02N-GRW	No	Upon examining the reported results it was suspected that the lanthanide results for samples MMW-30A-D01N-GRW and MMW-30A-D02N-GRW were inadvertently switched either at the laboratory or in the field. With the other two samples for which a primary and secondary filtration was done, the results for the first filtration ("D01N") were all greater than those for the second filtration ("D02N"). As such, it was considered highly probable that the sample labels were inadvertently mixed up in the field. The results have been associated with the proper field ID in the database per the field ID corrections made on the data sheets. The results of the secondary filtration samples are discussed in detail in the event specific DVR (see Section 5.3). Comparing the total and dissolved lanthanide results for the primary and field duplicate samples collected at MMW-30A, it became apparent that the labels for MMW-30A-D01D-GRW and MMW-30A-T01N-GRW were inadvertently mixed up as dissolved concentrations should be less than total concentrations. As such, the field IDs were corrected on the hardcopy data and the results in the database were associated with the proper field ID. For field duplicate samples MMW-30A-T01N-GRW and MMW-30A-T01D-GRW the percent RPDs were above evaluation criteria for Pb^{207}/Pb^{206} (RPD=54%) and Pb^{208}/Pb^{206} (RPD= 91%). These Pb results for the parent and duplicate samples were qualified as estimated (J FD-I). While no target analytes were detected in RB02T-GRW, lead was reported as present in RB02D-GRW at a concentration of 0.008 ug/l. As such, lead results ≤0.040 ug/l in filtered samples were qualified as nondetect (U RB – I). The only affected sample was CC-2A-D01N-GRW.

Review Parameter	Criteria Met?	Comments
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	
Laboratory Performance Parameters	Complete with "Yes", "No", or "N/A".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	As verified from QC summary data.
Initial/Continuing Calibration Verification	Yes	As verified from QC summary data.
Laboratory Control Sample Results	Yes	As Lanthanides (i.e. rare earth elements [REEs]) have not been common analytes of interest, few standard reference materials exist for use as laboratory control samples. As such, the accuracy of the analysis was evaluated based on the results obtained for two well-characterized reference water samples prepared by USGS. These two water samples are identified as PPREE (from the Pardise portal, upper Animas River basin, Colorado) and SCREE (from Spring Creek in the West Shasta mining district of Northern California). Additionally, FGS analyzed standard reference materials NIST-2710 and 2711; however, these reference materials were solids, not aqueous samples. As such, the aqueous samples were considered to be the more appropriate measure of accuracy for the analysis. For the aqueous reference water sample PPREE, the percent recoveries ranged from 102.8% to 108.0%. For the aqueous reference water sample SCREE, the percent recoveries ranged from 99.2% to 108.7%. As such, the accuracy of the lanthanide analysis relative to an aqueous medium was considered to be acceptable. For the solid reference samples NIST-2710 (a Montana soil) and NIST-2711 (a San Walken soil), some analyte recoveries were slightly outside the acceptance range of 75-125%. For NIST-2710, the recoveries of Sm, Eu, Dy, and Yb were 69.9%, 145.3%, 67.8%, and 161.2%, respectively. For NIST-2711, the recovery of Eu was 132.0%. Data qualification was not considered necessary because these certified reference materials were solids and the results obtained for the aqueous reference materials, as described above, were considered to be satisfactory and more representative of the sample matrix.
Compound Identification	NE	Could not verify from package provided.
Quantification	NE	Could not verify from package provided.
Verification	NE	Could not verify from package provided.
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	NE	Could not verify from package provided.

NE= Not Evaluated

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE MARCH 2004 GROUNDWATER/SURFACE WATER INTERACTION STUDY

Prepared for

Molycorp, Inc.
Questa, New Mexico

December 2004

URS

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Dilution Schemes/Non-Detects With Elevated RLs 3-1
3.2.2 Total Alkalinity Matrix Spike Analyses 3-1
3.2.3 Non-Valid Matrix Spikes 3-2
3.2.4 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Summary/Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.1.1 Piezometer Matrix Spike 4-2
4.1.2 Surface Water Matrix Spike 4-3
4.1.3 Post-Digestion Spikes 4-5
4.2 Laboratory Duplicate Results 4-5
4.3 Serial Dilution Results 4-5
4.3.1 Piezometer Serial Dilutions 4-5
4.3.2 Surface Water Serial Dilutions 4-6

Section 5 Collective Summary/Assessment of Field QC Results 5-1

5.1 Field Duplicate Samples 5-1
5.1.1 Piezometer Field Duplicate Results 5-2
5.1.2 Surface Water Field Duplicates Results 5-2
5.2 Rinsate Blank Results 5-2
5.3 Field Blank Results 5-4

Section 6 Overall Data Quality Indicator Assessment 6-5

6.1 Precision 6-5
6.2 Accuracy 6-5
6.3 Completeness 6-6
6.4 Representativeness 6-6
6.5 Comparability 6-7
6.6 Sensitivity 6-7

TABLE OF CONTENTS

List of Tables

Table 1-1 Summary of Groundwater Samples Collected March 2004 GSI Sampling Event

Table 1-2 Summary of Surface Water Samples Collected March 2004 GSI Sampling Event

Table 4-1 Field Samples Submitted for Matrix Spike

Table 4-2 Count of Matrix Spike Samples Collected March 2004 GSI Sampling Event

Table 4-3 Inorganic and Metals Matrix Spike Results for Piezometer Samples

Table 4-4 Inorganics and Metals Matrix Spike Results for Surface Water Samples

Table 4-5 ICP Serial Dilution Exceedances for Piezometer Samples

Table 4-6 ICP Serial Dilution Exceedances for Surface Water Samples

Table 5-1 Summary of Field Duplicate Water Samples Collected Summer 2004

Table 5-2 Field Duplicate Collection Frequency for the March 2004 GSI Sampling Event

Table 5.3 Field Duplicate Outliers and Corresponding Results Qualification for Surface Water Samples

Table 5-4 Rinsate Blanks Collected During the March 2004 GSI Sampling Event

Table 5-5 Rinsate Blank Collection Frequency for the March 2004 GSI Sampling Event

Table 5-6 Summary of Surface Water Rinsate Blank Results and Additional Qualifications

Table 6-1 Summary of Precision Assessment for March 2004 GSI Sampling Event

Table 6-2 Summary of Accuracy Assessment for March 2004 GSI Sampling Event

List of Attachments

Attachment 1.1 Data Review Summary Report for Data Package WAT267S

Attachment 1.2 Data Review Summary Report for Data Package WAT268S

Attachment 1.3 Data Review Summary Report for Data Package WAT269S

Attachment 1.4 Data Review Summary Report for Data Package WAT270S

Attachment 1.5 Data Review Summary Report for Data Package WAT271S

This Data Validation Report (DVR) provides a general overview of the usability of chemical data obtained from the Groundwater/Surface Water Interaction (GSI) Study, Round 2, conducted during the March 2004 sampling activities at Molycorp. In addition, this data validation report is intended to describe how various quality control results were collectively evaluated for the sampling event. The following sections describe elements of the decision making process regarding the end use of this data.

This report contains the results of the data validation conducted for piezometer and surface water samples collected in the March 2004 GSI sampling event at the Molycorp Questa Mine, Questa, New Mexico. During this event, groundwater samples were collected from triads of mini-piezometers in the Red River at ten locations of suspected upwelling. Additionally, surface water samples were collected at each location of a piezometer triad. The samples were collected on three separate days. Based on field parameter measurements, the decision was made to composite the three discrete samples from each piezometer in a triad. To composite, equal volumes from each piezometer sample were withdrawn from the sample container using a disposable plastic graduated syringe and deposited into a clean sample container.

These water samples were collected in support of the Remedial Investigation/Feasibility Study (RI/FS). The water samples were sent to Severn Trent Laboratories (STL) Burlington in Colchester, VT. The number of samples collected and analyses conducted were in accordance with the Field Sampling Plan Addendum for this study. The analytical methods used and quality control samples collected were in accordance with the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). The results were reported in five data packages.

The piezometer and surface water samples collected during the March 2004 GSI sampling event and their associated chemical analyses are summarized in Tables 1-1 and 1-2, respectively. Included in these tables is the frequency of QC samples collected for each matrix.

Table 1-1
Summary of Groundwater Samples
Collected March 2004 GSI Sampling Event

Sample Identification (SDG)	Dissolved Metals	Inorganics
LR-16-T01N-PS (WAT271S)		X
LR-16-D01N-PS (WAT271S)	X	
LR-16-T02N-PS (WAT270S)		X
LR-16-D02N-PS (WAT270S)	X	
LR-16-T03N-PS (WAT270S)		X
LR-16-D03N-PS (WAT270S)	X	
LR-8A-T01N-PS (WAT271S)		X
LR-8A-D01N-PS (WAT271S)	X	
LR-8A-T02N-PS (WAT270S)		X
LR-8A-D02N-PS (WAT270S)	X	
LR-8A-T03N-PS (WAT270S)		X
LR-8A-D03N-PS (WAT270S)	X	
LR-1-T01N-PS (WAT271S)		X
LR-1-D01N-PS (WAT271S)	X	
LR-1-T02N-PS (WAT270S)		X
LR-1-D02N-PS (WAT270S)	X	
LR-1-T03N-PS (WAT270S)		X

Table 1-1
Summary of Groundwater Samples
Collected March 2004 GSI Sampling Event

Sample Identification (SDG)	Dissolved Metals	Inorganics
LR-1-D03N-PS (WAT270S)	X	
RR-15-T01N-PS (WAT271S)		X
RR-15-D01N-PS (WAT271S)	X	
RR-15-T02N-PS (WAT270S)		X
RR-15-D02N-PS (WAT270S)	X	
RR-15-T03N-PS (WAT270S)		X
RR-15-D03N-PS (WAT270S)	X	
RR-13B-T01N-PS (WAT271S)		X, FD
RR-13B-D01N-PS (WAT271S)	X, FD	
RR-13B-T02N-PS (WAT270S)		X, FD
RR-13B-D02N-PS (WAT270S)	X, FD	
RR-13B-T03N-PS (WAT270S)		X, MS, LD
RR-13B-D03N-PS (WAT270S)	X, MS, LD	
RR-13A-T01N-PS (WAT270S)		X
RR-13A-D01N-PS (WAT271S)	X	
RR-13A-T02N-PS (WAT270S)		X
RR-13A-D02N-PS (WAT270S)	X	
RR-13A-T03N-PS (WAT270S)		X
RR-13A-D03N-PS (WAT270S)	X	
RR-11B3-T01N-PS (WAT271S)		X
RR-11B3-D01N-PS (WAT271S)	X	
RR-11B3-T02N-PS (WAT270S)		X
RR-11B3-D02N-PS (WAT270S)	X	
RR-11B3-T03N-PS (WAT270S)		X
RR-11B3-D03N-PS (WAT270S)	X	
RR-11B2-T01N-PS (WAT271S)		X
RR-11B2-D01N-PS (WAT271S)	X	
RR-11B2-T02N-PS (WAT270S)		X
RR-11B2-D02N-PS (WAT270S)	X	
RR-11B2-T03N-PS (WAT270S)		X, MS, LD
RR-11B2-D03N-PS (WAT270S)	X, MS, LD	
RR-5BB-T01N-PS (WAT271S)		X
RR-5BB-D01N-PS (WAT271S)	X	
RR-5BB-T02N-PS (WAT270S)		X
RR-5BB-D02N-PS (WAT270S)	X	
RR-5BB-T03N-PS (WAT270S)		X
RR-5BB-D03N-PS (WAT270S)	X	
ZWERGLE-T01N-PS (WAT271S)		X
ZWERGLE-D01N-PS (WAT271S)	X	
ZWERGLE-T02N-PS (WAT270S)		X
ZWERGLE-D02N-PS (WAT270S)	X	

Table 1-1
Summary of Groundwater Samples
Collected March 2004 GSI Sampling Event

Sample Identification (SDG)	Dissolved Metals	Inorganics
ZWERGLE-T03N-PS (WAT270S)		X
ZWERGLE-D03N-PS (WAT270S)	X	
Number Piezometer samples	30	30
Number MS/MSD or MS/LD	2	2
Number Field Duplicates	2	2
Number Rinsate Blanks	NA[1]	NA[1]
Number Field Blanks	NA[2]	NA[2]

NA = Not Applicable MS = Matrix Spike LD = Laboratory Duplicate FD = Field Duplicate

1 Dedicated and disposable tubing for sample collection and syringes for compositing were used.

2 No organic constituents were analyzed.

Table 1-2
Summary of Surface Water Samples Collected
March 2004 GSI Sampling Event

Sample Identification (SDG)	Total Metals	Dissolved Metals	Inorganics
LR-16-T01N-SFW (WAT267S)	X		X
LR-16-D01N-SFW (WAT267S)		X	
LR-16-T02N-SFW (WAT268S)	X		X
LR-16-D02N-SFW (WAT268S)		X	
LR-16-T03N-SFW (WAT269S)	X		X
LR-16-D03N-SFW (WAT269S)		X	
LR-8A-T01N-SFW (WAT267S)	X		X
LR-8A-D01N-SFW (WAT267S)		X	
LR-8A-T02N-SFW (WAT268S)	X, MS, LD		X, MS, LD
LR-8A-D02N-SFW (WAT268S)		X, MS, LD	
LR-8A-T03N-SFW (WAT269S)	X		X
LR-8A-D03N-SFW (WAT269S)		X	
LR-1-T01N-SFW (WAT267S)	X		X
LR-1-D01N-SFW (WAT267S)		X	
LR-1-T02N-SFW (WAT268S)	X, FD		X, FD
LR-1-D02N-SFW (WAT268S)		X, FD	
LR-1-T03N-SFW (WAT269S)	X		X
LR-1-D03N-SFW (WAT269S)		X	
RR-15-T01N-SFW (WAT267S)	X, RB		X, RB
RR-15-D01N-SFW (WAT267S)		X, RB	
RR-15-T02N-SFW (WAT268S)	X		X
RR-15-D02N-SFW (WAT268S)		X	
RR-15-T03N-SFW (WAT269S)	X		X
RR-15-D03N-SFW (WAT269S)		X	
RR-13B-T01N-SFW (WAT267S)	X		X
RR-13B-D01N-SFW (WAT267S)		X	
RR-13B-T02N-SFW (WAT268S)	X		X
RR-13B-D02N-SFW (WAT268S)		X	
RR-13B-T03N-SFW (WAT269S)	X		X

Table 1-2
Summary of Surface Water Samples Collected
March 2004 GSI Sampling Event

Sample Identification (SDG)	Total Metals	Dissolved Metals	Inorganics
RR-13B-D03N-SFW (WAT269S)		X	
RR-13A-T01N-SFW (WAT267S)	X		X
RR-13A-D01N-SFW (WAT267S)		X	
RR-13A-T02N-SFW (WAT268S)	X, RB		X, RB
RR-13A-D02N-SFW (WAT268S)		X, RB	
RR-13A-T03N-SFW (WAT269S)	X		X
RR-13A-D03N-SFW (WAT269S)		X	
RR-11B3-T01N-SFW (WAT267S)	X		X
RR-11B3-D01N-SFW (WAT267S)		X	
RR-11B3-T02N-SFW (WAT268S)	X		X
RR-11B3-D02N-SFW (WAT268S)		X	
RR-11B3-T03N-SFW (WAT269S)	X		X
RR-11B3-D03N-SFW (WAT269S)		X	
RR-11B2-T01N-SFW (WAT267S)	X		X
RR-11B2-D01N-SFW (WAT267S)		X	
RR-11B2-T02N-SFW (WAT268S)	X		X
RR-11B2-D02N-SFW (WAT268S)		X	
RR-11B2-T03N-SFW (WAT269S)	X		X
RR-11B2-D03N-SFW (WAT269S)		X	
RR-5BB-T01N-SFW (WAT267S)	X, MS, LD		X, MS, LD
RR-5BB-D01N-SFW (WAT267S)		X, MS, LD	
RR-5BB-T02N-SFW (WAT268S)	X		X
RR-5BB-D02N-SFW (WAT268S)		X	
RR-5BB-T03N-SFW (WAT269S)	X		X
RR-5BB-D03N-SFW (WAT269S)		X	
ZWERGLE-T01N-SFW (WAT267S)	X, FD		X, FD
ZWERGLE-D01N-SFW (WAT267S)		X, FD	
ZWERGLE-T02N-SFW (WAT268S)	X		X
ZWERGLE-D02N-SFW (WAT268S)		X	
ZWERGLE-T03N-SFW (WAT269S)	X		X
ZWERGLE-D03N-SFW (WAT269S)		X	
Number Surface Water samples	30	30	30
Number MS/MSD or MS/LD	2	2	2
Number Field Duplicates	2	2	2
Number Rinsate Blanks[1]	2	2	2
Number Field Blanks[2]	NA	NA	NA

NA = Not Applicable MS = Matrix Spike LD = Laboratory Duplicate FD = Field Duplicate RB=Rinsate Blank

1 Dedicated and disposable tubing for sample collection and syringes for compositing were used.

2 No organic constituents were analyzed.

The QAPP required that the quality control samples listed above be collected at a frequency of 5%. As illustrated by the tables above, the required frequency of QC analyses was satisfied for each analysis type.

The review consisted of an evaluation of laboratory performance criteria and sample-specific criteria in accordance with Standard Operating Procedure SOP 12.1, Analytical Data Validation for RI/FS data.

The review of sample-specific parameters includes evaluating parameters that are field sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate analyses, post-digestion spike recoveries, Inductively Coupled Plasma (ICP) Spectroscopy serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, rinsate blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated for all data packages.

The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Section 3.0 discusses the data review narratives for each of the data packages and data quality issues pertinent to all packages. All data review narratives are presented in Appendix 1. In all cases of professional judgment exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data validation narrative.

After completing the review of sample-specific and laboratory performance parameters in accordance with SOP 12.1, the site-specific matrix spike results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), and field duplicate results were assessed collectively by matrix and sampling event to determine the need for additional qualification of sample results of similar matrix. The reason for this is that site-specific QC samples are considered much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Where applicable, the potential direction of bias (high, low, or indeterminate) has been identified and noted on the sample results sheets as H, L, or I, respectively.

Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks, where applicable, and field duplicate results) and associated sample qualification.

An overall assessment of data, with respect to the Precision, Accuracy, Completeness, Representativeness, and Comparability (PACRC) parameters and sensitivity, is presented in Section 6.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for the data packages included in this event. In order to attain the frequency requirements for laboratory performance reviews, one data package (WAT269S) was evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identify whether findings globally affect all relevant water samples analyzed for the this March 2004 GSI sampling event. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

3.2.1 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

3.2.2 Total Alkalinity Matrix Spike Analyses

Initially, total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilbria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for total alkalinity were not assessed for accuracy.

3.2.3 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. They are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration.
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked analytes. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.4 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL data package WAT269S was used to evaluate laboratory performance criteria. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameter evaluation was found to be acceptable and no additional packages for this event required assessment of laboratory performance parameters.

Inorganic parameter matrix QC consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. The site-specific matrix QC results were assessed collectively for the March 2004 GSI sampling event by matrix (piezometer and surface water) to determine the need for qualification of sample results of similar matrix.

Two piezometer field samples were designated for both dissolved metals and inorganics matrix spike analyses. Two surface water field samples were designated for total/dissolved metals, and inorganics matrix spike analyses, as summarized in Table 4-1. Table 4-2 summarizes the breakdown of frequency requirements for each of the analyses per each matrix for the March 2004 GSI sampling event.

Table 4-1
Field Samples Submitted for Matrix Spike

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics
RR-13B-T03N-PS	Piezometer	WAT270S			x
RR-13B-D03N-PS	Piezometer	WAT270S		x	
RR-11B2-T03N-PS	Piezometer	WAT270S			x
RR-11B2-D03N-PS	Piezometer	WAT270S		x	
RR-5BB-T01N-SFW	Surface Water	WAT267S	x		x
RR-5BB-D01N-SFW	Surface Water	WAT267S		x	
LR-8A-T02N-SFW	Surface Water	WAT268S	x		x
LR-8A-D02N-SFW	Surface Water	WAT268S		x	

Table 4-2
Count of Matrix Spike Samples Collected in March 2004 GSI Sampling Event

Analyses	Number of MS samples	Total Samples	Percentage (%)
Piezometer			
Dissolved Metals	2	30	6.6
Inorganics	2	30	6.6
Surface Water			
Total Metals	2	31	6.5
Dissolved Metals	2	31	6.5
Inorganics	2	31	6.5

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results. A number of spikes recoveries were outside of the QC acceptance limits of 75-125% for both inorganics and metals. In general, if less than a quarter of the valid spike recoveries (i.e., the sample concentration was no greater than four times the spike added) for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results

for that analyte in all samples of the same matrix may have been qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

Tables 4-3 and 4-4 summarize the piezometer and surface water, respectively, inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

4.1.1 Piezometer Matrix Spike

Although the majority of the piezometer matrix spike recoveries were within acceptance limits, few exceedances were observed resulting in data qualification. Results were generally qualified as estimated.

Table 4-3
Inorganic and Metals Matrix Spike
Results for Piezometer Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Inorganics					
Fluoride	2	**1**	0	61.50	J MS-L for parent sample only
Sulfate	2	0	0	81.50	
TOC	2	**1**	0	89.00	J MS-L for parent sample only
Dissolved Metals					
Aluminum	1	0	0	123.6	
Antimony	2	0	0	87.2	
Arsenic	2	0	0	91.5	
Barium	2	0	0	100.2	
Beryllium	2	0	0	93.8	
Boron	2	0	0	95.5	
Cadmium	2	**1**	0	84.4	J MS-L for parent sample only
Chromium	2	0	0	96.8	
Cobalt	2	0	0	92.9	
Copper	2	0	0	95.1	
Iron	1	0	0	100.7	
Lead	2	0	0	108.7	
Manganese	1	0	0	88.4	
Molybdenum	2	0	0	97.6	
Selenium	2	0	0	83.4	
Nickel	2	0	0	96.3	
Thallium	2	0	0	109.4	
Silver	2	0	0	99.9	
Vanadium	2	0	0	96.8	
Zinc	2	**1**	0	85.1	J MS-L for parent sample only

For fluoride, TOC, cadmium, and zinc, it was not considered necessary to extend qualification to the balance of the March 2004 GSI piezometer samples because less than a quarter of the spike results were outside evaluation criteria and the average recoveries were within the acceptance range. Since there were only four matrix spike recoveries outside of limits of a possible 43 matrix spike results, the vast majority (>90%) were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

4.1.2 Surface Water Matrix Spike

Although the majority of the surface water matrix spike recoveries were within acceptance limits, few exceedances were observed resulting in data qualification. Results were generally qualified as estimated.

Table 4-4
Inorganics and Metals Matrix Spike
Results for Surface Water Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Inorganinc					
Chloride	2	0	0	103.00	
Nitrate	2	0	0	98.00	
Total alkalinity[1]	2	0	0	105.50	
Fluoride	2	0	0	100.00	
Ammonia	2	**1**	0	74.00	J MS-L, parent sample only
TKN	2	0	0	99.00	
Nitrite	2	0	0	114.50	
Ortho-P	2	0	0	108.00	
Phosphate	2	0	0	101.50	
BOD	2	0	0	94.00	
COD	2	0	0	104.50	
Sulfate	2	0	0	96.50	
TOC	2	0	**1**	122.50	J MS-H, parent sample only
Total Metals					
Aluminum	2	0	0	107.0	
Antimony	2	0	0	93.1	
Arsenic	2	0	0	97.0	
Barium	2	0	0	104.0	
Beryllium	2	0	0	109.4	
Boron	2	0	0	105.0	
Cadmium	2	0	0	96.4	
Chromium	2	0	0	106.1	
Cobalt	2	0	0	106.8	
Copper	2	0	0	102.1	
Iron	2	0	0	110.1	
Lead	2	0	0	105.5	
Manganese	2	0	0	105.9	
Mercury	2	0	0	105.1	
Molybdenum	2	0	0	101.4	

Table 4-4
Inorganics and Metals Matrix Spike
Results for Surface Water Samples

Analyte	No. of Valid Spikes	Recoveries <75%	Recoveries >125%	Average %R	Action
Selenium	2	0	0	90.0	
Nickel	2	0	0	102.6	
Thallium	2	0	0	104.4	
Silver	2	0	0	102.8	
Vanadium	2	0	0	102.3	
Zinc	2	0	0	104.5	
Cyanide	2	0	0	81.8	
Dissolved Metals					
Aluminum	2	0	0	105.2	
Antimony	2	0	0	98.3	
Arsenic	2	0	0	98.7	
Barium	2	0	0	106.4	
Beryllium	2	0	0	110.9	
Boron	2	0	0	106.5	
Cadmium	2	0	0	99.8	
Chromium	2	0	0	107.1	
Cobalt	2	0	0	108.2	
Copper	2	0	0	103.2	
Iron	2	0	0	107.4	
Lead	2	0	0	105.9	
Manganese	2	0	0	108.2	
Mercury	2	0	0	98.8	
Molybdenum	2	0	0	104.3	
Selenium	2	0	0	90.4	
Nickel	2	0	0	103.4	
Thallium	2	0	0	104.7	
Silver	2	0	0	104.1	
Vanadium	2	0	0	103.7	
Zinc	2	0	0	105.5	

[1] MS recoveries for total alkalinity analyses are not an appropriate measure of accuracy due to the highly variable pH range (see Section 3.2.2). Therefore, the matrix spike recovery data for total alkalinity was not used to assess the accuracy of the analysis.

For ammonia and TOC, it was not considered necessary to extend qualification to the balance of the March 2004 GSI surface water samples because less than a quarter of the spike results were outside evaluation criteria and the average recovery was within the acceptance range. Since there were only two matrix spike recoveries outside of limits out of 110 matrix spike results, the vast majority (>98%) were within acceptance limits. As such, the overall level of accuracy demonstrated on the site-specific sample matrix is considered to be acceptable.

4.1.3 Post-Digestion Spikes

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the matrix spike exceedances were the result of sample matrix, and/or due to a bias in the analytical system. Recoveries for all post-digestion spikes were within the acceptance limits.

4.2 LABORATORY DUPLICATE RESULTS

All of the laboratory duplicate results for both surface water and piezometer samples were within the laboratory acceptance limits. As such, the precision of the analyses relative to the sample matrix is considered to be acceptable.

4.3 SERIAL DILUTION RESULTS

ICP serial dilutions are analyzed to help evaluate whether or not interferences exist due to sample matrix. When analyte concentrations are sufficiently high (50x greater than the instrument detection limit [IDL]), the original and five-fold dilution results are expected to agree within 10%. Otherwise, interferences resulting in signal suppression or enhancement might be suspected.

The original and diluted sample results are compared by a percent difference (%D). When %Ds of ≤10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate than the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result.

In general, qualification was limited to the percent sample if fewer than a quarter of the applicable serial dilutions results were outside the acceptance range. Conversely, if more than a quarter of the applicable serial dilution results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average %D, the magnitude of the exceedances, and the number of valid measurements relative to the size of the sample set.

4.3.1 Piezometer Serial Dilutions

Table 4-5 summarizes the piezometer serial dilution results for only those analytes that had exceedances. With the exceptions noted in the table, all remaining %Ds between the original sample results and the result obtained from a five-fold diluted sample were ≤10%.

Table 4-5
ICP Serial Dilution Exceedances for Piezometer Samples

Analyte	Number of Serial Dilution samples analyzed	Number of Valid Results	%Ds >10%	Avg. %Ds	Potential Bias Direction		Action
					Low	High	
Dissolved Antimony	3	2	1	8.3	1	0	UJ DL-L, parent (RR-13B) results only
Dissolved Cadmium	3	2	1	12.7	1	0	J DL-L, parent (RR-13B) results only
Dissolved Cobalt	3	3	1	6.7	1	0	J DL-L, parent (RR-13B) results only
Dissolved Nickel	3	3	1	4.3	1	0	J DL-L, parent (RR-13B) results only
Dissolved Zinc	3	3	1	7.9	1	0	UJ DL-L, parent (RR-13B) results only

Since only five out of 55 applicable serial dilution results were outside of limits, the vast majority (>91%) were within acceptance limits. The few results that were qualified were limited to parent sample results for the following reasons:

- The dissolved antimony, cobalt, nickel, and zinc sample result qualifications were limited to the parent sample because the exceedances were marginal and the average %Ds were less than 10%.
- For dissolved cadmium there were two applicable serial dilution results. While one serial dilution result exceedance was slightly more than marginal (20.1%), the other result was very low (5.2%). Since the two applicable results were somewhat disparate and the average %D was only 12.7%, the result qualification was limited to the parent sample because it was considered likely that the potential interference problem was limited to the parent sample.

4.3.2 Surface Water Serial Dilutions

Table 4-6 summarizes the surface water serial dilution results for only those analytes that had exceedances. With the exceptions noted in the table, all remaining %Ds between the original sample results and the result obtained from a five-fold diluted sample were ≤10%.

Table 4-6
ICP Serial Dilution Exceedances for Surface Water Samples

Analyte	Number of Serial Dilution samples analyzed	Number of Valid Results	%Ds >10%	Avg. %Ds	Potential Bias Direction		Action
					Low	High	
Dissolved Iron	2	2	2	13.5	1	0	UJ/J DL-L, parent (RR-5BB and LR-8A) results only
Total Sodium	3	2	1	7.0	1	0	J DL-L, parent (LR-8A) results only

Since only three out of 92 applicable serial dilution results were outside of limits, the vast majority (>97%) were within acceptance limits. The few samples that were qualified were limited to parent sample results for the following reasons:

- Qualification for dissolved iron was limited to the parent samples, RR-5BB-D01N-SFW and LR-8A-D02N-SFW. For these samples, both results were outside of criteria with %D exceedances that were considered slightly more than marginal (12.7% and 14.3%). As there were so few problems with the serial dilution analyses on the total (i.e., unfiltered) counterpart, it was considered likely that the potential interference problems were limited to the parent samples.
- The total sodium qualification was limited to the parent sample because the exceedance was marginal and the average %D was less than 10%.

The site-specific blanks (field and rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. Field duplicate agreement was assessed to determine the overall precision of the analyses; both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. The following sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

5.1 FIELD DUPLICATE SAMPLES

Four field duplicate sample pairs were collected during this sampling event. The field duplicate pairs and frequencies are listed in the Table 5-1 and 5-2 below. As there were thirty piezometer and thirty surface water samples collected, the frequency of field duplicate collection satisfied the QAPP requirement of 5%.

Table 5-1
Summary of Field Duplicate Water Samples Collected Summer 2004

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics
RR-13B-T02N-PS/ RR-13B-T02D-PS	Piezometer	WAT270S			x
RR-13B-D02N-PS/ RR-13B-D02D-PS	Piezometer	WAT270S		x	
RR-13B-T01N-PS/ RR-13B-T01D-PS	Piezometer	WAT271S			x
RR-13B-D01N-PS/ RR-13B-D01D-PS	Piezometer	WAT271S		x	
ZWERGLE-T01N-SFW/ ZWERGLE-T01D-SFW	Surface water	WAT267S	x		x
ZWERGLE-D01N-SFW/ ZWERGLE-D01D-SFW	Surface water	WAT267S		x	
LR-1-T02N-SFW/LR-1-T02D-SFW	Surface water	WAT268S	x		x
LR-1-D02N-SFW/LR-1-D02D-SFW	Surface water	WAT268S		x	

Table 5-2
Field Duplicate Collection Frequency for the March 2004 GSI Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
Piezometer			
Dissolved Metals	2	30	6.6
Inorganics	2	30	6.6
Surface Water			
Total Metals	2	30	6.6
Dissolved Metals	2	30	6.6
Inorganics	2	30	6.6

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion of ≤25% was applied for cases in which both the sample and sample duplicate concentration were greater than two times the RL. For field duplicate pairs where the sample or duplicate concentration was less than five times the reporting limits, the absolute difference between the sample and duplicate was compared to the criterion of two times the greater RL. For metals, the CLP CRDL was used

as the RL for these concentration dependent evaluations. With a few exceptions, the applicable evaluation criterion was met. The exceptions and the resultant data qualifiers are summarized below.

5.1.1 Piezometer Field Duplicate Results

All field duplicate results were within evaluation criteria for piezometer samples, therefore, no qualifications of data were necessary.

5.1.2 Surface Water Field Duplicates Results

The surface water field duplicate sample results not meeting acceptance criteria and resultant data qualification issued is summarized in Table 5-3 below.

Table 5-3
Field Duplicate Outliers and Corresponding Results
Qualification for Surface Water Samples

Sample ID	Analyte	RPD or Difference	Action
Inorganics			
ZWERGLE-T01N/T01D-SFW	Chloride	RPD=58.8%	J FD-I for parent sample
Dissolved Metals			
ZWERGLE-D01N/D01D-SFW	Manganese	AD=6.4xRL	J FD-I for parent sample

AD=Absolute Difference RL=Reporting Limit

Data qualification was issued to the parent samples ZWERGLE-T01N/T01D-SFW and ZWERGLE-D01N/D01D-SFW for chloride and dissolved manganese, respectively, because there was only one valid detect within the samples. The results were qualified as estimated with an indeterminate bias direction.

Although some results were qualified based on field duplicate agreement, the vast majority (>97%) of the field duplicate results were within limits. As such, the field duplicate results are considered to be indicative of acceptable overall combined sampling and analysis precision.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blanks are prepared in an identical manner to the samples with which they are associated. Rinsate blanks samples were prepared by pouring ASTM Type II water or laboratory supplied “reagent-free” water over decontamination sampling equipment and collecting the water in appropriate sample containers. Tables 5-4 and 5-5 summarize the rinsate blank samples associated with the samples collected during the March 2004 GSI sampling event.

Table 5-4
Rinsate Blanks Collected During the March 2004 GSI Sampling Event

Sample ID	Matrix	Data Package	Total Metals	Dissolved Metals	Inorganics
RB01T-SFW	Surface Water	WAT267S	x		x
RB01D-SFW	Surface Water	WAT267S		x	x
RB02T-SFW	Surface Water	WAT268S	x		x
RB02D-SFW	Surface Water	WAT268S		x	x

Rinsate blanks were not collected for the piezometer samples because dedicated tubing was used for sample collection. The QAPP required frequency of 5% for the collection of rinsate blanks was met for the March 2004 GSI sampling event.

Table 5-5
Rinsate Blank Collection Frequency for the March 2004 GSI Sampling Event

Analyses	Number of RB samples	Total Samples	Percentage (%)
Surface Water			
Total Metals	2	30	6.5
Dissolved Metals	2	30	6.5
Inorganics	2	30	6.5

The surface water rinsate blank detections and the resulting data qualification issued are summarized in Table 5-6. To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results of the appropriate sample matrix that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration. As this approach was considered more appropriate than using a zero for the nondetect result which might bias the average low or biasing the average high by using the reporting limit.

Table 5-6 summarizes the analytes detected in the associated surface water rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered due to contamination present in the rinsate blanks.

Table 5-6
Summary of Surface Water Rinsate Blank Results and Additional Qualifications

Analyte	Sample ID	Conc.	RL	Frequency of Detection	Ave Conc	Range of Field samples	Action
Bicarbonate (as CaCO3) and Total Alkalinity	RB01T-SFW	2.8	1	2 of 2	2.2	52.7 to 90.8	None, as all sample concentrations were >11 mg/L.
	RB02T-SFW	1.6					
Chloride	RB01T-SFW	0.25	0	1 of 2	0.18	2.1 to 11.9	None, as all sample concentrations were <0.9 mg/L.
Total Dissolved Solids	RB01T-SFW	12	5	2 of 2	12	122 to 334	None, as all sample concentrations were <60 mg/L.
	RB02T-SFW	12					
Total Organic Carbon	RB02T-SFW	1.4	1	1 of 2	0.95	1.5 to 8.5	All results <4.75 mg/L were qualified as nondetect (U RB-I).
Total Suspended Solids	RB01T-SFW	0.5	1	1 of 2	0.38	3 to 60	None, as all sample concentrations were <1.9 mg/L.
Total Zinc	RB02T-SFW	1.7	2	1 of 2	3.13	1.5 to 104	All total results <15.65 ug/L were qualified as nondetect (U RB-I).

ND = Nondetect MDL = Method Detection Limit RL = Reporting Limit

[1]Criteria for qualification was based on 5x the average concentration found in the rinsate blanks.

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels. Rinsate blanks were not collected for piezometer samples because dedicated tubing was used for sample collection and disposable syringes were used for compositing. No piezometer sample results were qualified on the basis of the surface water rinsate blanks.

5.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field blanks were generated by pouring laboratory-supplied reagent grade water into certified pre-cleaned sample containers at the sample collection site. In accordance with the project QAPP, field blanks were only required for volatile organic compounds and semivolatile organic compounds parameters, therefore, no field blanks were required for the March 2004 GSI sampling event.

All results for field samples are considered usable as qualified. Some sample results were qualified as nondetect on the basis of laboratory or rinsate blank contamination. In addition, some sample results were qualified as estimated on the basis matrix, field, or laboratory QC results, as described above and in the individual data package review summaries. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives. A general assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment for
March 2004 GSI Sampling Event

Analysis Type	QC Measure	# of Analytes Measured	# Within Criteria	% Results within Criteria
Piezometer				
Inorganics	FD	6	6	100
	LD	6	6	100
Dissolved Metals	FD	48	48	100
	LD	48	48	100
Surface Water				
Inorganics	FD	38	37	97.5
	LD	38	38	100
Total Metal	FD	48	48	100
	LD	48	48	100
Dissolved Metals	FD	48	47	98
	LD	48	48	100

6.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Percent of MS (and MSD) recoveries meeting criteria are summarized in Table 6-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters.

Table 6-2
Summary of Accuracy Assessment for March 2004 GSI Sampling Event

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
Piezometer				
Inorganics	MS	6	4	68
Dissolved Metals	MS	40	38	95
Surface Water				
Inorganics	MS	28	26	93
Total Metals	MS	42	42	100
Dissolved Metals	MS	42	42	100

The overall level of accuracy, both analytical and combined analytical and sampling demonstrated is considered to be acceptable.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

There were thirty piezometer and thirty surface water samples collected during the March 2004 GSI sampling event. All of the piezometer and surface water samples yielded valid results for all target analytes, therefore the overall completeness was 100%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the piezometer and surface water samples collected during the March 2004 GSI sampling event. The close agreement between the field duplicate results, as discussed in Section 5.1, indicated that the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 4.2 indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

The laboratory reported the metals results relative to the IDL rather than their routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. As such, obtaining some nondetect results with elevated reporting limits was not avoidable. While it is anticipated that all data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT267S Sampling Event: GSI, Round 2 (Day 1 Surface Water)

Matrix: Solid ❑ Water ☑ Biota ❑

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Ansley Watson Date Completed: 6/9/04

Peer Reviewer: Stacey Coker Date Completed: 6/14/04

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation	Analysis		
				Matrix	Metals	Inorganics[2]
LR-16-T01N-SFW	SA	564670		W	X	X
LR-16-D01N-SFW	SA	564671		W	X	
LR-1-T01N-SFW	SA	564672		W	X	X
LR-1-D01N-SFW	SA	564673		W	X	
ZWERGLE-T01N-SFW	SA	564674		W	X	X
ZWERGLE-D01N-SFW	SA	564675		W	X	
ZWERGLE-T01D-SFW	FD	564676		W	X	X
ZWERGLE-D01D-SFW	FD	564677		W	X	
LR-8A-T01N-SFW	SA	564678		W	X	X
LR-8A-D01N-SFW	SA	564679		W	X	
RR-15-T01N-SFW	SA	564680		W	X	X
RR-15-D01N-SFW	SA	564681		W	X	
RB01T-SFW	RB	564682		W	X	X
RB01D-SFW	RB	564683		W	X	
RR-5BB-T01N-SFW	SA	564684		W	X	X
RR-5BB-D01N-SFW	SA	564685		W	X	
RR-11B2-T01N-SFW	SA	564686		W	X	X
RR-11B2-D01N-SFW	SA	564687		W	X	
RR-13A-T01N-SFW	SA	564688		W	X	X
RR-13A-D01N-SFW	SA	564689		W	X	
RR-13B-T01N-SFW	SA	564690		W	X	X
RR-13B-D01N-SFW	SA	564691		W	X	
RR-11B3-T01N-SFW	SA	564692		W	X	X
RR-11B3-D01N-SFW	SA	564693		W	X	

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteriab Met?	Comments
Sample-specific Parameters	*Complete with "Yes", "No", or "Not Applicable"*	*For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.*
COC & Sample Receipt	Yes	
Holding Times	No	The original TDS analysis for sample RB01T-SFW was accomplished within the prescribed holding time. However, due to an inconsistent result this sample was re-analyzed 3 days beyond the holding time. The result from the re-analysis was formally presented, while the data from the original analysis is provided in the raw data section of the data package. The BOD analyses for the samples in this sample delivery group (SDG) were accomplished 1 day beyond the prescribed holding time. These samples were received on the last day of the holding time and the analyses were performed as soon as possible upon sample receipt. The original nitrate analyses for the samples in this SDG were accomplished within the prescribed holding time. However, due to problems associated with the instrument software, these samples required re-analyses, which were accomplished 1 day beyond the holding time for samples LR-16-T01N-SFW, LR-1-T01N-SFW, ZWERGLE-T01N-SFW, ZWERGLE-T01D-SFW, and LR-8A-T01N-SFW. All other samples in this SDG required additional re-analyses 8 days beyond the holding time due to quality control outages associated with this analytical sequence. For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrite as N and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 12 days, respectively. Table 1.1 summarizes the holding time qualifications for all of the above anomalies. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Low levels of aluminum, ammonia, antimony, beryllium, boron, cadmium, chromium, cobalt, iron, mercury, thallium, TKN, and vanadium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS RR-5BB-T01N-SFW RR-5BB-D01N-SFW • LD RR-5BB-T01N-SFW RR-5BB-D01N-SFW	No	Although the case narrative noted that the ammonia laboratory duplicate results for RR-5BB-T01N-SFW was out, upon further review it did not appear that this was valid; therefore no qualification was necessary. All of the other analytes met the criteria specified by the QAPP of 75-125%, therefore no qualification was necessary. The matrix quality control results for the 2004 GSI Round 2 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-5BB-T01N-SFW RR-5BB-D01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the samples for RR-5BB-T01N-SFW and RR-5BB-D01N-SFW. Serial dilution results for sample RR-5BB-T01N-SFW were applicable for 21 of 24 metals. Serial dilution results for sample RR-5BB-D01N-SFW were applicable for 20 out of 24 metals. Also, in sample RR-5BB-T01N-SFW, the percent difference between the original result and result for the diluted sample for iron did not satisfy the ≤10% criterion and the results for this sample were qualified as estimated. Table 1.3 summarizes these results. The serial dilution results for the 2004 GSI, Round 2 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results.

Review Parameter	Criteriab Met?	Comments
Sample-specific Parameters	*Complete with "Yes", "No", or "Not Applicable"*	*For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.*
		Recovery for internal standard Li was high for the ICPMS analysis of all the samples in this SDG. Therefore, potassium results for all samples were reported from the trace ICP. The trace ICP potassium reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The total and dissolved cobalt results in samples RR-5BB-T01N/D01N-SFW was qualified as estimated (UJ/J TvP-I) because the dissolved result was greater than the total result. The total and dissolved chromium results in samples RR-13A-T01N/D01N-SFW was qualified as estimated (UJ/J TvP-I) because the dissolved result was greater than the total result beyond the variation expected due to the accuracy limitations of the method. For sample RB01T/D-SFW, the cation/anion balances was outside the acceptance range of ±13%. The contribution from using detection limits for nondetectable results is greater than that from the detectable values due to the clean nature of the sample. Therefore, no qualification was considered necessary.
Field QC • Field Duplicate (FD) ZWERGLE--T01D-SFW ZWERGLE-D01D-SFW • Rinsate Blank (RB) RB01T-SFW RB01D-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	There were a few field duplicate results that did not satisfy the applicable concentration-dependent evaluation criteria. These are summarized in Table 1.4. There were a few detections in the various rinsate blanks (RB). These are summarized in Table 1.5. The matrix quality control results for the 2004 GSI, Round 2 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH	BOD	TDS
LR-16-T01N-SFW	0.49 J	0.005 UJ	0.01 UJ	260 J	7.4 J	1.4 UJ	---
LR-1-T01N-SFW	0.48 J	0.005 UJ	0.01 UJ	227 J	7.4 J	1.4 UJ	---
ZWERGLE-T01N-SFW	0.48 J	0.005 UJ	0.01 UJ	151 J	7.6 J	1.4 UJ	---
ZWERGLE-T01D-SFW	0.49 J	0.005 UJ	0.01 UJ	152 J	7.9 J	1.4 UJ	---
LR-8A-T01N-SFW	0.49 J	0.005 UJ	0.01 UJ	277 J	7.6 J	1.4 UJ	---
RR-15-T01N-SFW	0.45 J	0.005 UJ	0.01 UJ	245 J	7.6 J	1.4 UJ	---
RB01T-SFW	0.20 UJ	---	---	0.000 J	8.1 J	1.4 UJ	12 J
RR-5BB-T01N-SFW	0.44 J	---	0.01 UJ	208 J	6.9 J	1.4 UJ	---
RR-11B2-T01N-SFW	0.45 J	---	0.01 UJ	205 J	7.2 J	1.4 UJ	---
RR-13A-T01N-SFW	0.44 J	0.005 UJ	0.01 UJ	233 J	7.2 J	1.4 UJ	---
RR-13B-T01N-SFW	0.46 J	0.005 UJ	0.01 UJ	235 J	7.2 J	1.4 UJ	---
RR-11B3-T01N-SFW	0.46 J	---	0.01 UJ	225 J	7.3 J	1.4 UJ	---

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum (P) DF=1		-36.3					17.6	RR-5BB-T01N-SFW	J CCB-L
Ammonia DF=1						0.041	0.04	All samples in this SDG	U MB-I
Antimony (MS) DF=1	-0.6	-0.6	-0.6	-0.6	-0.6	PBW0330B -0.672 PBW0331A -0.59	0.4	All samples in this SDG	UJ CCB-L Or UJ CCB, MB-L
	-1.5	-1.5							
Beryllium (P) DF=1	0.2	0.7					0.2	RR-5BB-T01N-SFW, RR-5BB-D01N-SFW	U CCB-I
Boron (P) DF=1		2.1					1.8	RR-5BB-T01N-SFW, RR-5BB-D01N-SFW	U CCB-I
Cadmium (MS) DF=1	-0.2						0.2	RR-5BB-T01N-SFW, RR-5BB-D01N-SFW	J CCB-L
Chromium (MS) DF=1		0.1		0.1	0.1	PBW0330B 0.724 PBW0331A 0.483	0.1	All samples in this SDG	U MB-I
Cobalt (P) DF=1	-1.6						1.1	RR-5BB-T01N-SFW, RR-5BB-D01N-SFW	J CCB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Iron (P) DF=1	-62.6						19.2	RR-5BB-D01N-SFW	UJ CCB-L
Mercury (CV) DF=1	-0.1	-0.2	-0.2	-0.1		-0.11	0.1	All samples in this SDG	UJ CCB, MB-L
Thallium (MS) DF=1	0.1	0.1	0.1	0.1	0.1	PBW0330B 0.118 PBW0331A 0.113	0.1	All samples in this SDG	U CCB, MB-I Or U CCB-I
	0.1	0.1							
TKN DF=1						0.25	0.24	LR-16-T01N-SFW, RR-5BB-T01N-SFW, RR-11B2-T01N-SFW, RR-13A-T01N-SFW, RR-11B3-T01N-SFW	U MB-I
Vanadium (MS) DF=1	0.2					PBW0330B 0.239 PBW0331A 0.207	0.2	All samples in this SDG	U CCB, MB-I Or U MB-I

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
RR-5BB-D01N-SFW			
Iron	12.7%	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample UJ DL-L

Table 1.4
Field Duplicates Not Meeting Criteria

Sample/Analytes	RPD	RL (µg/l)	Evaluation Criteria	Action
ZWERGLE-T01N/T01D-SFW				
Chloride	RPD=58.8%	0.20	Both samples are > than 5x RL, precision is indicated by an RPD ≤30%.	These results were qualified as estimated in the parent samples (J FD-I).
ZWERGLE -D01N/D01D-SFW				
	Absolute Difference	**RL (mg/l)**	**Evaluation Criteria**	
Manganese	AD =6.4	1.9	Absolute difference >2x RL (i.e., 3.8)	These results were qualified as estimated in the parent samples (J FD-I).

AD=Absolute difference

Table 1.5
Rinsate Blank Detections

Analytes	RB01T-SFW
Bicarbonate Alkalinity (mg/l)	2.8
Total Alkalinity (mg/l)	2.8
TSS (mg/l)	0.5
Chloride (mg/l)	0.25
TDS (mg/l)	12.0

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT268S Sampling Event: GSI, Round 2 (Day 2 Surface Water)

Matrix: Solid ❑ Water ☑ Biota ❑

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Ansley Watson Date Completed: 5/26/04

Peer Reviewer: Stacey Coker Date Completed: 6/29/04

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation	Analysis		
				Matrix	Metals	Inorganics[2]
LR-16-T02N-SFW	SA	564821		W	X	X
LR-16-D02N-SFW	SA	564822		W	X	
LR-8A-T02N-SFW	SA	564823		W	X	X
LR-8A-D02N-SFW	SA	564824		W	X	
RR-15-T02N-SFW	SA	564825		W	X	X
RR-15-D02N-SFW	SA	564826		W	X	
ZWERGLE-T02N-SFW	SA	564827		W	X	X
ZWERGLE-D02N-SFW	SA	564828		W	X	
LR-1-T02N-SFW	SA	564829		W	X	X
LR-1-D02N-SFW	SA	564830		W	X	
LR-1-T02D-SFW	FD	564831		W	X	X
LR-1-D02D-SFW	FD	564832		W	X	
RR-13A-T02N-SFW	SA	564833		W	X	X
RR-13A-D02N-SFW	SA	564834		W	X	
RB02T-SFW	RB	564835		W	X	X
RB02D-SFW	RB	564836		W	X	
RR-11B2-T02N-SFW	SA	564837		W	X	X
RR-11B2-D02N-SFW	SA	564838		W	X	
RR-11B3-T02N-SFW	SA	564839		W	X	X
RR-11B3-D02N-SFW	SA	564840		W	X	
RR-13B-T02N-SFW	SA	564841		W	X	X
RR-13B-D02N-SFW	SA	564842		W	X	
RR-5BB-T02N-SFW	SA	564843		W	X	X
RR-5BB-D02N-SFW	SA	564844		W	X	

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteriab Met?	Comments
Sample-specific Parameters	*Complete with "Yes", "No", or "Not Applicable"*	*For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.*
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. The analysis for pH and conductivity were exceeded by 2 and 12 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony, aluminum, beryllium, boron, chromium, copper, iron, molybdenum, nickel, potassium, silver, sodium, and vanadium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS LR-8A-T02N-SFWS LR-8A-D02N-SFWS • LD LR-8A-T02N-SFWD LR-8A-D02N-SFWD	No	Although the case narrative noted that the ammonia laboratory duplicate results for LR-8A-T02N-SFW was out, the laboratory case narrative comment was based on the RPD between the results. As both results were less than 5x RL, the RPD was not the appropriate evaluation criteria. The ammonia laboratory duplicate results agreed within ±1x RL; therefore no qualification was necessary. Table 1.3 summarizes the matrix spike results outside the evaluation criteria and resultant data qualification. The matrix quality control results for the GSI Round 2 2004 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution LR-8A-T02N-SFW LR-8A-D02N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the matrix spike samples for LR-8A-T02N-SFW and LR-8A-D02N-SFW. Serial dilution results for sample LR-8A-T02N-SFW were applicable for 21 of 24 metals. Serial dilution results for sample LR-8A-D02N-SFW were applicable for 20 out of 24 metals. The percent difference between the original result and result for the diluted sample for a few analytes did not satisfy the ≤10% criterion and the parent sample results were qualified as estimated. Table 1.4 summarizes these results. The serial dilution results for the GSI, Round 2 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. The total and dissolved cobalt results in samples LR-16-T02N-D02N-SFW, RR-15-T02N/D02N-SFW, RR-13A-T02N/D02N-SFW, RR-13B-T02N/D02N-SFW, and RR-5BB-T02N/D02N-SFW were qualified as estimated (UJ/J TvP-I) because the dissolved result was greater than the total result beyond the variation expected due to typical accuracy and precision limits of the methods.
Field QC • Field Duplicate (FD) LR-1-T02D-SFW LR-1-D02D-SFW • Rinsate Blank (RB) RB02T-SFW	Yes	The field duplicate results satisfied the applicable concentration-dependent evaluation criteria and data qualification was not necessary. The matrix quality control results for the GSI, Round 2 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteriab Met?	Comments
Sample-specific Parameters	*Complete with "Yes", "No", or "Not Applicable"*	*For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.*
RB02D-SFW • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)		There were no detections in the rinsate blank (RB) samples. Rinsate blank detections will be evaluated collectively and resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package. Fluoride dilution factors as a function of Aluminum concentration The chelating buffer used by STL-B in the fluoride analysis is sufficient to eliminate interference from aluminum concentrations up to 3 mg/l. Higher aluminum concentrations can result in suppression of fluoride. For the samples listed in Table 1.5, the dilution in the fluoride analysis was not sufficient to reduce all interference from aluminum. As such, these fluoride results were qualified as estimated with a potential low bias. A reason code of "I" for interference was assigned.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	Conductivity (umhos/cm)	pH
LR-16-T02N-SFW	0.49 J	0.005 UJ	0.01 UJ	273 J	7.5 J
LR-8A-T02N-SFW	0.49 J	---	0.01 UJ	291 J	7.4 J
RR-15-T02N-SFW	0.50 J	---	0.01 UJ	249 J	7.5 J
ZWERGLE-T02N-SFW	0.47 J	0.005 UJ	0.01 UJ	155 J	7.6 J
LR-1-T02N-SFW	0.50 J	---	0.01 UJ	235 J	7.6 J
LR-1-T02D-SFW	0.50 J	---	0.01 UJ	241 J	7.2 J
RR-13A-T02N-SFW	0.47 J	---	0.01 UJ	237 J	7.5 J
RB02T-SFW	0.20 UJ	0.005 UJ	0.01 UJ	4.2 J	7.8 J
RR-11B2-T02N-SFW	0.48 J	---	---	207 J	7.0 J
RR-11B3-T02N-SFW	0.51 J	---	---	226 J	7.3 J
RR-13B-T02N-SFW	0.51 J	---	0.01 UJ	241 J	7.2 J
RR-5BB-T02N-SFW	0.49 J	---	---	206 J	7.4 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	CCB7 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS) DF=1				-0.5	-0.4	-0.5	-0.5	PBW0331B -0.7	0.4	All samples in this SDG	UJ CCB, MB-L
	-1.3	-1.3	-1.3								
Aluminum (P) DF=1				-46.7				PBW0331D -48.4	17.6	LR-1-D02D-SFW, RR-11B2-D02N-SFW, RR-11B3-D02N-SFW, RR-13B-D02N-SFW, RR-5BB-D02N-SFW	J/UJ CCB-L Or J/UJ CCB, MB-L
Beryllium (P) DF=1				0.4	0.3			PBW0331C -0.3 PBW0331D 0.2	0.2	All samples in this SDG	UJ MB-L Or UJ/J MB, CCB-L Or U CCB, MB-I
Boron (P) DF=1	3.4	2.2						PBW0331C 2.0	1.8	LR-16-T02N-SFW, LR-16-D02N-SFW, LR-8A-T02N-SFW, LR-8A-D02N-SFW, RR-15-T02N-SFW, RR-15-D02N-SFW, ZWERGLE-T02N-SFW, ZWERGLE-D02N-SFW, LR-1-T02N-SFW, LR-1-D02N-SFW, LR-1-T02D-SFW, LR-1-D02D-SFW, RR-13A-T02N-SFW, RR-13A-D02N-SFW	U CCB-I Or U CCB, MB-I Or U MB-I
Chromium (P) DF=1	-1.1	-0.9	-1.3	-1.4	-2.5			PBW0331C -1.0 PBW0331D -0.9	0.8	All samples in this SDG	UJ CCB, MB-L
Cobalt (P) DF=1	-1.7	-1.5	-1.9	-2.4	-2.8			PBW0331C -1.8 PBW0331D -2.0	1.1	All samples in this SDG	UJ/J CCB, MB-L
Copper (MS) DF=1	-1.1	-1.1	-1.1					PBW0331A -0.81	0.8	RR-5BB-D02N-SFW	J CCB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	CCB7 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Iron (P) DF=1	-21	-49.2	-56.8	-82.7	-52.3			PBW0331C -59.0 PBW0331D -61.2	19.2	LR-16-D02N-SFW, LR-8A-D02N-SFW, RR-15-D02N-SFW, ZWERGLE-T02N-SFW, ZWERGLE-D02N-SFW, LR-1-D02N-SFW, LR-1-D02D-SFW, RR-13A-T02N-SFW, RR-13A-D02N-SFW, RB02T-SFW, RB02D-SFW, RR-11B2-T02N-SFW, RR-11B2-D02N-SFW, RR-11B3-T02N-SFW, RR-11B3-D02N-SFW, RR-13B-D02N-SFW, RR-5BB-T02N-SFW, RR-5BB-D02N-SFW	UJ/J CCB, MB-L Or UJ/J CCB-L
Molybdenum (MS) DF=1				1.4	1.4	1.4	1.4	PBW0331B 1.326	0.3	RR-15-T02N-SFW, RR-15-D02N-SFW, ZWERGLE-T02N-SFW, ZWERGLE-D02N-SFW, LR-1-T02N-SFW, LR-1-D02N-SFW, LR-1-T02D-SFW, LR-1-D02D-SFW, RR-13A-T02N-SFW, RR-13A-D02N-SFW, RB02T-SFW, RB02D-SFW	U CCB, MB-I
	1.2	0.3	0.3							RR-11B2-T02N-SFW, RR-11B2-D02N-SFW, RR-11B3-T02N-SFW, RR-11B3-D02N-SFW, RR-13B-T02N-SFW, RR-13B-D02N-SFW, RR-5BB-T02N-SFW, RR-5BB-D02N-SFW	U CCB-I
Mercury (AS) DF=1				-0.1	-0.1	-0.1	-0.2		0.1	All samples in this SDG except: RR-13B-T02N-SFW, RR-13B-D02N-SFW, RR-5BB-T02N-SFW, RR-5BB-D02N-SFW	UJ/J CCB, MB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	CCB7 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Nickel (MS) DF=1	-1.0	-0.9	-0.9						0.9	RR-5BB-D02N-SFW	J CCB-L
Potassium (P) DF=1	-345	-409	-640	-566	-778			PBW0331C -254.2 PBW0331D -758.9	109.3	All samples in this SDG	J CCB-L Or J MB, CCB-L
Sodium (P) DF=1	791	911	288	652				PBW0331C 572.2 PBW0331D 738.8	172.6	ZWERGLE-T02N-SFW, ZWERGLE-D02N-SFW, RB02T-SFW, RB02D-SFW	U CCB, MB-I
Silver (MS) DF=1	-0.2	-0.2	-0.2					-0.251	0.1	RR-13B-T02N-SFW, RR-13B-D02N-SFW, RR-5BB-T02N-SFW, RR-5BB-D02N-SFW	UJ CCB, MB-L
Vanadium (MS) DF=1								PBW0331B 0.213	0.2	LR-16-T02N-SFW, LR-16-D02N-SFW, LR-8A-D02N-SFW, RR-15-T02N-SFW, RR-15-D02N-SFW, ZWERGLE-T02N-SFW, ZWERGLE-D02N-SFW, LR-1-T02N-SFW, LR-1-D02N-SFW, LR-1-T02D-SFW, LR-1-D02D-SFW, RR-13A-T02N-SFW, RR-13A-D02N-SFW	U MB-I

P=ICP MB=Method Blank CCBx=Continuing Calibration Blank IDL=Instrument Detection Limit

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results And Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
LR-8A-T02N-SFW					
Ammonia	70	NA	75-125%	NONE	J MS-L parent sample only
TOC	150	NA		NONE	J MS-H parent sample only

NA = Not appropriate

[1] The low recovery was caused by suppressive matrix interference caused by aluminum.

Table 1.4
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
LR-8A-T02N-SFW			
Sodium	11.2%	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample J DL-L
LR-8A-D02N-SFW			
Iron	14.3%	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample J DL-L

Table 1.5
Fluoride Dilutions verses Dissolved Aluminum Results

Sample	Fluoride	Fluoride DF	Fluoride RL (mg/L)	Dissolved Aluminum (mg/l)	DF Needed
RR-5BB-T03N-PS	1.3 J	1	0.10	13.0	5
RR-13B-T03N-PS	3.5 J	1	0.10	94.9	~30
RR-13A-T03N-PS	3.3 J	1	0.10	33.8	~10
RR-5BB-T02N-PS	1.3 J	1	0.10	13.3	~5
RR-13B-T02N-PS	3.6 J/ 3.5 J	1	0.10	94.3/ 91.6	~30
RR-13A-D02N-PS	3.3 J	1	0.10	32.4	~10

DF = Dilution Factor RL=Reporting Limit

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT269S Sampling Event: GSI, Round 2 (Day 3 Surface Water)

Matrix: Solid ❑ Water ☑ Biota ❑

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **Yes**

Data Reviewer: Ansley Watson Date Completed: 5/21/04 and 6/14/04

Peer Reviewer: Stacey Coker Date Completed: 5/24/04 and 6/14/04

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Laboratory Form Field ID Abbreviation	Matrix	Analysis		
					Metals	Inorganics[2]	TPH-DRO
DECANT-T01N-SFW	SA	564980		W	X	X	X
DECANT-D01N-SFW	SA	564981		W	X		
GHGC-T01N-SFW	SA	564982		W	X	X	
GHGC-D01N-SFW	SA	564983		W	X		
RR-11B2-T03N-SFW	SA	564984		W	X	X	
RR-11B2-D03N-SFW	SA	564985		W	X		
RR-13B-T03N-SFW	SA	564986		W	X	X	
RR-13B-D03N-SFW	SA	564987		W	X		
RR-11B3-T03N-SFW	SA	564988		W	X	X	
RR-11B3-D03N-SFW	SA	564989		W	X		
RR-15-T03N-SFW	SA	564990		W	X	X	
RR-15-D03N-SFW	SA	564991		W	X		
LR-16-T03N-SFW	SA	564992		W	X	X	
LR-16-D03N-SFW	SA	564993		W	X		
LR-8A-T03N-SFW	SA	564994		W	X	X	
LR-8A-D03N-SFW	SA	564995		W	X		
ZWERGLE-T03N-SFW	SA	564996		W	X	X	
ZWERGLE-D03N-SFW	SA	564997		W	X		
LR-1-T03N-SFW	SA	564998		W	X	X	
LR-1-D03N-SFW	SA	564999		W	X		
RR-5BB-T03N-SFW	SA	565000		W	X	X	
RR-5BB-D03N-SFW	SA	565001		W	X		
RR-13A-T03N-SFW	SA	565002		W	X	X	
RR-13A-D03N-SFW	SA	565003		W	X		

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Review Parameter	Criteriab Met?	Comments
Sample-specific Parameters	*Complete with "Yes", "No", or "Not Applicable"*	*For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.*
COC & Sample Receipt	Yes	A 500ml aliquot of sample DECANT-T01N-SFW was taken from the TSS bottle to perform the Diesel Range Organics (DRO) analysis.
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N, nitrite as N, and orthophosphate. Also, the 7-day hold time for the BOD samples was exceeded by 1 day. The analysis for pH and conductivity were exceeded by 3 and 11 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony, aluminum, beryllium, boron, chromium, iron, molybdenum, silver, sodium, and zinc were detected in various blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	No	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the GSI, Round 2 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution • DECANT-T01N-SFW • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the matrix spike sample for DECANT-T01N-SFW. The serial dilution results for sample DECANT-T01N-SFW were applicable for 8 of 24 metals. The serial dilution results for the GSI, Round 2 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results if %Ds in excess of 10% were obtained. The orthophosphate and phosphorus results were qualified as estimated (J/UJ TvP-I) for sample DECANT-T03N/D03N-SFW because the orthophosphate result was significantly greater than the phosphorus result. The total and dissolved cobalt results in samples RR-11B2-T03N/D03N-SFW, RR-13B-T03N/D03N-SFW, RR-11B3-T03N-D03N-SFW, RR-15-T03N/D03N-SFW, LR-16-T03N/D03N-SFW, LR-8A-T03N/D03N-SFW, ZWERGLE-T03N/D03N-SFW, LR-1-T03N/D03N-SFW, RR-5BB-T03N/D03N-SFW, and RR-13A-T03N/D03N-SFW were qualified as estimated (UJ/J TvP-I) because the dissolved result was greater than the total result. The total and dissolved molybdenum results in sample LR-8A-T03N/D03N-SFW was qualified as estimated (UJ/J TvP-I) because the dissolved result was greater than the total result. The total and dissolved chromium results in sample ZWERGLE-T03N/D03N-SFW was qualified as estimated (UJ/J TvP-I) because the dissolved result was greater than the total result.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	NA	This package did not include any field quality control samples. The field quality control results for the GSI, Round 2 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteriab Met?	Comments
Sample-specific Parameters	*Complete with "Yes", "No", or "Not Applicable"*	*For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.*
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	Yes	
Quantification	Yes	
Verification	Yes	
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Orthophosphate (mg/L)	BOD	Conductivity (umhos/cm)	pH
DECANT-T01N-SFW	---	0.0085 J	2.6 J	2.0 J	981 J	6.8 J
GHGC-T01N-SFW	---	---	---	2.1 J	441 J	9.6 J
RR-11B2-T03N-SFW	---	0.005 UJ	0.01 UJ	1.4 UJ	204 J	7.2 J
RR-13B-T03N-SFW	---	0.005 UJ	0.01 UJ	1.4 UJ	245 J	7.2 J
RR-11B3-T03N-SFW	---	0.005 UJ	0.01 UJ	1.4 UJ	228 J	7.2 J
RR-15-T03N-SFW	0.20 UJ	0.005 UJ	0.01 UJ	1.4 UJ	248 J	7.2 J
LR-16-T03N-SFW	0.20 UJ	0.005 UJ	0.01 UJ	1.4 UJ	287 J	7.2 J
LR-8A-T03N-SFW	0.20 UJ	0.005 UJ	0.01 UJ	1.4 UJ	321 J	7.2 J
ZWERGLE-T03N-SFW	0.20 UJ	0.005 UJ	0.021 J	1.4 UJ	165 J	7.4 J
LR-1-T03N-SFW	0.20 UJ	0.005 UJ	0.01 UJ	1.4 UJ	254 J	1.4 J
RR-5BB-T03N-SFW	---	0.005 UJ	0.01 UJ	1.4 UJ	226 J	7.4 J
RR-13A-T03N-SFW	---	0.005 UJ	0.01 UJ	1.4 UJ	255 J	7.3 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS) DF=1	-1.3	-1.3	-1.3	-1.3		-1.4 PBW0402B -1.4 PBW0405A	0.4	All samples in this SDG.	UJ CCB, MB-L
Aluminum (P) DF=1	22.9			31.8	-20.0	22.7 PBW0402A -75.8 PBW0402C	17.6	DECANT-D01N-SFW, ZWERGLE-T03N-SFW, ZWERGLE-D03N-SFW, LR-1-D03N-SFW, RR-5BB-D03N-SFW, RR-13A-D03N-SFW	U CCB, MB-I Or UJ CCB, MB-L Or J MB-L
Beryllium (P) DF=1	-0.2			0.2	0.3	-0.2 PBW0402A	0.2	All samples in this SDG, with the exception of RR-13A-T03N-SFW and RR-13A-D03N-SFW.	UJ/J CCB, MB-L Or UJ/J MB-L Or U CCB-I
Boron (P) DF=1	2.1					2.1 PBW0402A	1.8	DECANT-T01N-SFW, DECANT-D01N-SFW, GHGC-T01N-SFW, GHGC-D01N-SFW, RR-11B2-T03N-SFW, RR-11B2-D03N-SFW	U CCB, MB-I
Chromium (MS) DF=1						0.4 PBW0402B	0.1	DECANT-T01N-SFW, DECANT-D01N-SFW, GHGC-D01N-SFW, RR-11B2-T03N-SFW, RR-11B2-D03N-SFW, RR-13B-T03N-SFW, RR-13B-D03N-SFW, RR-11B3-T03N-SFW, RR-11B3-D03N-SFW, RR-15-T03N-SFW, RR-15-D03N-SFW, LR-16-T03N-SFW, LR-16-D03N-SFW, LR-8A-T03N-SFW, LR-8A-D03N-SFW	U MB-I
Iron (P) DF=1	-36.6	-37.6	-30.9	94.8	-33.5		19.2	DECANT –T01N-SFW, DECANT-D01N-SFW, GHGC-D01N-SFW, RR-11B2-D03N-SFW, RR-13B-D03N-SFW, RR-11B3-D03N-SFW, RR-15-D03N-SFW, LR-16-D03N-SFW, LR-8A-D03N-SFW, ZWERGLE-T03N-SFW, ZWERGLE-D03N-SFW, LR-1-D03N-SFW, RR-5BB-T03N-SFW, RR-5BB-D03N-SFW, RR-13A-T03N-SFW, RR-13A-D03N-SFW	UJ/J CCB-L Or U CCB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Molybdenum (MS) DF=1	1.5	0.7	0.5	0.5		0.7 PBW0402B 0.3 PBW0405A	0.3	RR-11B2-T03N-SFW, RR-11B2-D03N-SFW, RR-13B-T03N-SFW, RR-13B-D03N-SFW, RR-11B3-T03N-SFW, RR-11B3-D03N-SFW, RR-15-T03N-SFW, RR-15-D03N-SFW, ZWERGLE-T03N-SFW, ZWERGLE-D03N-SFW, RR-5BB-T03N-SFW, RR-5BB-D03N-SFW, RR-13A-T03N-SFW, RR-13A-D03N-SFW	U CCB-I Or U CCB, MB-I
Silver (MS) DF=1	-0.2	-0.2	-0.2	-1.3		-0.2 PBW0402B -0.2 PBW0405A	0.1	All samples in this SDG.	UJ CCB, MB-L
Sodium (P) DF=1			-808.2	-650.1	328.9	174.4 PBW0402A	172.6	ZWERGLE-T03N-SFW	J CCB-L
Zinc (P) DF=1						5.5 PBW0402A	1.5	LR-16-D03N-SFW, ZWERGLE-T03N-SFW, ZWERGLE-D03N-SFW, RR-5BB-D03N-SFW	U MB-I

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit

DF = listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS) DF=1	-1.6	-1.6	-1.6	-1.6		-1.611 PBW0406B -1.703 PBW0405A	0.4	All the samples in this SDG.	UJ CCB, MB-L
Aluminum (P) DF=1	29.6		81	32.0	22.7	43.82 PBW0402C	17.6	LR-8A-D03N-PS, LR-16-D03N-PS, LR-1-D03N-PS, ZWERGLE-D03N-PS, RR-11B3-D03N-PS, LR-16-D02N-PS, ZWERGLE-D02N-PS, LR-1-D02N-PS, RR-15-D02N-PS, LR-8A-D02N-PS, RR-11B3-D02N-PS	U CCB, MB-I Or U CCB-I
Beryllium (P) DF=1			-0.4		-0.2		0.2	LR-1-D03N-PS, ZWERGLE-D03N-PS, RR-11B2-D03N-PS, RR-15-D03N-PS, RR-11B3-D03N-PS, LR-16-D02N-PS, ZWERGLE-D02N-PS, LR-1-D02N-PS, RR-15-D02N-PS, RR-11B2-D02N-PS, LR-8A-D02N-PS, RR-11B3-D02N-PS	UJ CCB-L Or J CCB-L
Boron (P) DF=1	3.5	3.7	2.3	3.5	4.3	4.384 PBW0406A	1.8	RR-5BB-D03N-PS, ZWERGLE-D03N-PS, RR-13B-D03N-PS, RR-13A-D03N-PS, RR-11B2-D03N-PS, RR-15-D03N-PS, RR-11B3-D03N-PS, ZWERGLE-D02N-PS, RR-5BB-D02N-PS, RR-13B-D02N-PS, RR-13B-D02D-PS, RR-13A-D02N-PS, RR-15-D02N-PS, RR-11B2-D02N-PS, RR-11B3-D02N-PS	U CCB, MB-I
Chromium (P) DF=1	1.0	-1.6	1.0	1.3			0.8	All samples in this SDG.	UJ CCB-L Or U CCB-I
Copper (MS) DF=1	-0.8	-0.9	-0.8	-0.8	-0.8		0.7	LR-8A-D03N-PS, LR-16-D03N-PS, ZWERGLE-D03N-PS, RR-11B3-D03N-PS, LR-16-D02N-PS, ZWERGLE-D02N-PS, RR-15-D02N-PS, RR-11B2-D02N-PS, LR-8A-D02N-PS, RR-11B3-D02N-PS	UJ/J CCB-L

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Iron (P) DF=1	22.2	-59.3	27.2		-27.0		19.2	LR-8A-D03N-PS, LR-16-D03N-PS, RR-5BB-D03N-PS, LR-1-D03N-PS, ZWERGLE-D03N-PS, RR-11B2-D03N-PS, RR-15-D03N-PS, RR-11B3-D03N-PS, LR-16-D02N-PS, ZWERGLE-D02N-PS LR-1-D02N-PS, RR-5BB-D02N-PS, RR-15-D02N-PS, RR-11B2-D02N-PS LR-8A-D02N-PS, RR-11B3-D02N-PS	UJ CCB-L Or U CCB-I Or J CCB-L
Molybdenum (P) DF=1				2.9	1.5		1.0	RR-11B2-D02N-PS, RR-15-D02N-PS, RR-11B3-D02N-PS, RR-13A-D02N-PS	U CCB-I
Nickel (MS) DF=1	-0.9	-1.0	-1.0	-1.0			1.4	LR-16-D03N-PS, LR-1-D03N-PS, ZWERGEL-D03N-PS, LR-16-D02N-PS, ZWERGLE-D02N-PS, LR-1-D02N-PS	UJ/J CCB-L
Potassium (P) DF=1			-254.7		-164.1	-160.0 PBW0406A -250.8 PBW0402C	109.3	ZWERGLE-D03N-PS, RR-11B2-D03N-PS, RR-15-D03N-PS, ZWERGLE-D02N-PS, RR-5BB-D02N-PS	UJ/J CCB, MB-L Or UJ/J CCB-L
Silver (MS) DF=1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.249 PBW0406B -0.249 PBW0405A	0.1	All samples in this SDG.	UJ/J CCB, MB-L
Vanadium (MS) DF=1	0.4	0.4	0.4			0.452 PBW0406A 0.484 PBW0402C	0.2	LR-8A-D03N-PS, RR-5BB-D03N-PS, RR-13B-D03N-PS, RR-13A-D03N-PS, LR-1-D03N-PS, ZWERGLE-D03N-PS, RR-11B2-D03N-PS, RR-15-D03N-PS, RR-11B3-D03N-PS, ZWERGLE-D02N-PS, LR-1-D02N-PS, RR-5BB-D02N-PS, RR-13B-D02N-PS, RR-13B-D02D-PS, RR-13A-D02N-PS, RR-15-D02N-PS, RR-11B2-D02N-PS, LR-8A-D02N-PS, RR-11B3-D02N-PS	U CCB, MB-I Or U MB-I
Zinc (P) DF=1						2.863 PBW0402C	1.5	LR-16-D02N-PS LR-1-D02N-PS	U MB-I

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit RL = Reporting Limit

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
RR-13B-T03N-PS					
Fluoride	33.0[1]	NA	75-125%	NONE	J MS-L parent sample only
TOC	60	NA		NONE	J MS-L parent sample only
RR-13B-D03N-PS					
Cadmium	72.0	82.2	75-125%	NONE	J MS-L parent sample only
Zinc	72.7	83.4		NONE	J MS-L parent sample only

NA = Not appropriate

[1] The low recovery was caused by suppressive matrix interference caused by aluminum.

Table 1.3
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
RR-13B-D03N-PS			
Antimony	15.7	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample UJ DL-L
Beryllium	10.4%		None, parent sample rounds to 10%.
Boron	10.3%		None, parent sample rounds to 10%.
Cadmium	20.1%		Qualify parent sample J DL-L
Cobalt	11.0%		Qualify parent sample J DL-L
Nickel	11.2%		Qualify parent sample J DL-L
Zinc	12.7%		Qualify parent sample UJ DL-L

Table 1.4
Fluoride Dilutions verses Dissolved Aluminum Results

Sample	Fluoride	Fluoride DF	Fluoride RL (mg/L)	Dissolved Aluminum (mg/l)	DF Needed
RR-5BB-T03N-PS	1.3 J	1	0.10	13.0	5
RR-13B-T03N-PS	3.5 J	1	0.10	94.9	~30
RR-13A-T03N-PS	3.3 J	1	0.10	33.8	~10
RR-5BB-T02N-PS	1.3 J	1	0.10	13.3	~5
RR-13B-T02N-PS	3.6 J/ 3.5 J	1	0.10	94.3/ 91.6	~30
RR-13A-D02N-PS	3.3 J	1	0.10	32.4	~10

DF = Dilution Factor RL = Reporting Limit

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT271S Sampling Event: GSI, Round 2 (Piezometers)

Matrix: Solid ❑ Water ☑ Biota ❑

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Ansley Watson Date Completed: 4/29/04

Peer Reviewer: Stacey Coker Date Completed: 5/1/04

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	Analysis		
			Matrix	Metals	Inorganics[2]
RR-13A-T01N-PS	SA	565089	W		X
RR-13A-D01N-PS	SA	565090	W	X	
RR-13B-T01N-PS	SA	565091	W		X
RR-13B-D01N-PS	SA	565092	W	X	
RR-13B-T01D-PS	FD	565093	W		X
RR-13B-D01D-PS	FD	565094	W	X	
RR-5BB-T01N-PS	SA	565095	W		X
RR-5BB-D01N-PS	SA	565096	W	X	
RR-15-T01N-PS	SA	565097	W		X
RR-15-D01N-PS	SA	565098	W	X	
ZWERGLE-T01N-PS	SA	565099	W		X
ZWERGLE-D01N-PS	SA	565100	W	X	
RR-11B3-T01N-PS	SA	565101	W		X
RR-11B3-D01N-PS	SA	565102	W	X	
LR-8A-T01N-PS	SA	565103	W		X
LR-8A-D01N-PS	SA	565104	W	X	
LR-16-T01N-PS	SA	565105	W		X
LR-16-D01N-PS	SA	565106	W	X	
LR-1-T01N-PS	SA	565107	W		X
LR-1-D01N-PS	SA	565108	W	X	
RR-11B2-T01N-PS	SA	565109	W		X
RR-11B2-D01N-PS	SA	565110	W	X	

Matrix: S = Solid W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

In accordance with the sampling plan, inorganic parameters for this study were limited to fluoride, sulfate and TOC due to the limited sample volume available.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The issues addressed in the case narrative are all summarized in the following tables.

Due to a limited sample volume, the trace ICP metals analysis for sample RR-11B2-D02N-PS and its associated matrix spike and replicate were accomplished using the ICP/MS digestate. All associated quality control analyses exhibited acceptable recoveries.

Review Parameter	Criteriab Met?	Comments
Sample-specific Parameters	*Complete with "Yes", "No", or "Not Applicable"*	*For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.*
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blank Results	No	Antimony, aluminum, beryllium, boron, chromium, copper, iron, molybdenum, sodium, and zinc were detected in various blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	No	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the GSI Piezometers 2004, Round 2 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-13A-D01N-PS • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses was conducted on the matrix spike sample for RR-13A-D01N-PS. Sample RR-13A-D02N-PS was applicable for 10 of 24 metals. The serial dilution results for the GSI Piezometers, Round 2 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. Recovery for internal standard Y was high for samples RR-13A-D01N-PS, RR-13B-D01N-PS, and RR-13B-D01D-PS. However, the beryllium and molybdenum results were all reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.
Field QC • Field Duplicate (FD) RR-13B-D02N/D02D-PS • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	The field duplicate results satisfied the applicable concentration-dependent evaluation criteria and data qualification was not necessary. The matrix quality control results for the GSI Piezometers, Round 2 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	

Review Parameter	Criteriab Met?	Comments
Sample-specific Parameters	*Complete with "Yes", "No", or "Not Applicable"*	*For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.*
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample (ICS) Results As none of the "on-instrument" concentrations of the interferent elements were greater than or equal to the concentrations present in the ICS solution, the ICS evaluation was not necessary for this package. Fluoride dilution factors as a function of Aluminum concentration The chelating buffer used by STL-B in the fluoride analysis is sufficient to eliminate interference from aluminum concentrations up to 3 mg/l. Higher aluminum concentrations can result in suppression of fluoride. For the samples listed in Table 1.2, the dilution in the fluoride analysis was not sufficient to reduce all interference from aluminum. As such, these fluoride results were qualified as estimated with a potential low bias. A reason code of "I" for interference was assigned.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples qualified	Qualification Code
Antimony (MS) DF=1	-0.5	-0.5	-0.5		-0.669	0.4	All samples in this SDG.	UJ CCB, MB-L
Aluminum (P) DF=1		90.8	88.8	72.0		17.6	RR-15-D01N-PS, RR-11B3-D01N-PS, LR-8A-D01N-PS, LR-16-D01N-PS, LR-1-D01N-PS, RR-11B2-D01N-PS	U CCB-I
Beryllium (P) DF=1				-0.3	-0.474	0.2	RR-15-D01N-PS, ZWERGLE-D01N-PS, RR-11B3-D01N-PS, LR-8A-D01N-PS, LR-16-D01N-PS, LR-1-D01N-PS, RR-11B2-D01N-PS	UJ/J CCB, MB-L Or JU/J MB-L
Boron (P) DF=1		3.5	3.2		3.971	1.8	RR-13A-D01N-PS, RR-5BB-D01N-PS, RR-15-D01N-PS, ZWERGLE-D01N-PS, RR-11B3-D01N-PS, LR-8A-D01N-PS, LR-16-D01N-PS, RR-11B2-D01N-PS	U CCB, MB-I

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples qualified	Qualification Code
Chromium (P) DF=1		-3.3	-3.1	-3.1	-2.344	0.8	All samples in this SDG.	UJ/J CCB, MB-L
Copper (MS) DF=1		0.9	1.9			0.7	RR-15-D01N-PS, ZWERGLE-D01N-PS, RR-11B3-D01N-PS, LR-8A-D01N-PS, LR-16-D01N-PS, LR-1-D01N-PS, RR-11B2-D01N-PS	U CCB-I
Iron (P) DF=1		56.1	88.0	34.8	21.67	19.2	RR-5BB-D01N-PS, RR-15-D01N-PS, RR-11B3-D01N-PS, LR-8A-D01N-PS, LR-16-D01N-PS, LR-1-D01N-PS, RR-11B2-D01N-PS	U CCB, MB-I Or U CCB-I
Molybdenum (P) DF=1		3.5	2.9	2.9	4.221	1.0	RR-13A-D01N-PS, RR-13B-D01N-PS, RR-13B-D01D-PS, RR-5BB-D01N-PS, RR-15-D01N-PS, ZWERGLE-D01N-PS, RR-11B3-D01N-PS, LR-1-D01N-PS, RR-11B2-D01N-PS	U CCB, MB-I
Sodium (P) DF=1				-727.4	748.2	172.6	ZWERGLE-D01N-PS	U MB-I
Zinc (P) DF=1		-2.4	-2.2	-2.5	-2.245	1.5	LR-16-D01N-PS	J CCB, MB-L

P=ICP MB = Method Blank CCBx = Continuing Calibration Blank IDL = Instrument Detection Limit

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.2
Fluoride Dilutions verses Dissolved Aluminum Results

Sample	Fluoride	Fluoride DF	Fluoride RL (mg/L)	Dissolved Aluminum (mg/l)	DF Needed
RR-13A-T01N-PS	3.4 J	1	0.10	24.4	~7
RR-13B-T01N-PS	3.6 J	1	0.10	88.0	~25
RR-13B-T01D-PS	3.6 J	1	0.10	88.9	~25
RR-5BB-T01N-PS	1.3 J	1	0.10	12.6	~10

DF = Dilution Factor RL = Reporting Limit

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE APRIL 2004 QUARTERLY GROUNDWATER AND SURFACE WATER

Prepared for

Molycorp, Inc.
Questa, New Mexico

January 2005

URS

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 General Data Quality Issues 3-1
3.1.1 Holding Blanks 3-1
3.1.2 Manual Integration 3-1
3.1.3 Low-Level Detections 3-1
3.1.4 TICs Reported In Blanks 3-1
3.1.5 Dilution Schemes/Non-Detects With Elevated Rls 3-2
3.1.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 3-2
3.1.7 Non-Valid Matrix Spikes 3-2
3.1.8 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Assessment of Matrix Quality Control Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.1.1 Organic Matrix Spike Results 4-2
4.1.2 Inorganic Matrix Spike Results 4-3
4.1.3 Post-Digestion Spikes 4-5
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-6
4.3 ICP Serial Dilution Results 4-6

Section 5 Collective Assessment of Field Qual9ty Control Results 5-1

5.1 Field Duplicate Agreement 5-1
5.2 Rinsate Blank Results 5-2
5.3 Field Blank Results 5-5
5.4 Trip Blank Results 5-5

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-2
6.3 Completeness 6-2
6.4 Representativeness 6-3
6.5 Comparability 6-3
6.6 Sensitivity 6-3

TABLE OF CONTENTS

List of Tables

Table 1-1 Summary of Groundwater Samples Collected April 2004

Table 1-2 Summary of Surface Water Samples Collected April 2004

Table 4-1 Field Samples Designated for Matrix QC Analysis

Table 4-2 Frequency Requirements for Matrix QC

Table 4-3 Organics Matrix Spike Results

Table 4-4 Inorganics Matrix Spike Results

Table 4-5 Metals Matrix Spike Results

Table 4-6 Inorganic Laboratory Duplicate Results

Table 4-7 ICP Serial Dilution Results

Table 4-8 ICP Serial Dilution Overall Assessment

Table 5-1 Summary of Field Duplicate Samples Collected April 2004

Table 5-2 Field Duplicate Collection Frequency for the April 2004 Sampling Event

Table 5-3 Summary of Field Duplicate Sample Exceedances

Table 5-4 Summary of Rinsate Blank Results and Additional Qualifications

Table 5-5 Summary of Field Blank Samples Collected April 2004

Table 6-1 Summary of Precision Assessment for April 2004

Table 6-2 Summary of Accuracy Assessment for April 2004

List of Attachments

Attachment 1.1 Data Review Summary for Data Package WAT272C

Attachment 1.2 Data Review Summary for Data Package WAT273A

Attachment 1.3 Data Review Summary for Data Package WAT274C

Attachment 1.4 Data Review Summary for Data Package WAT275S

Attachment 1.5 Data Review Summary for Data Package WAT276C

Attachment 1.6 Data Review Summary for Data Package WAT277C

Attachment 1.7 Data Review Summary for Data Package WAT278C

Attachment 1.8 Data Review Summary for Data Package WAT279C

Attachment 1.9 Data Review Summary for Data Package WAT280C

Attachment 1.10 Data Review Summary for Data Package WAT281C

Attachment 1.11 Data Review Summary for Data Package WAT282C

Attachment 1.12 Data Review Summary for Data Package WAT283C

Attachment 1.13 Data Review Summary for Data Package WAT284A

TABLE OF CONTENTS

Attachment 1.14	Data Review Summary for Data Package WAT285S
Attachment 1.15	Data Review Summary for Data Package WAT285SA
Attachment 1.16	Data Review Summary for Data Package WAT286A
Attachment 1.17	Data Review Summary for Data Package WAT287C
Attachment 1.18	Data Review Summary for Data Package WAT288A
Attachment 1.19	Data Review Summary for Data Package WAT289A
Attachment 1.20	Data Review Summary for Data Package WAT290A
Attachment 1.21	Data Review Summary for Data Package WAT291A
Attachment 1.22	Data Review Summary for Data Package WAT292C
Attachment 1.23	Data Review Summary for Data Package WAT293C

This Data Validation Report (DVR) provides a general overview of the usability of the surface and ground water chemical analytical data obtained during the April 2004 sampling event at Molycorp Questa Mine in Questa, New Mexico. This report contains the results and process of the sample specific data reviews and collective evaluations for the water samples collected in support of the Remedial Investigation/Feasibility Study (RI/FS) during the month of April 2004.

April 2004 RI/FS water samples were submitted to Severn Trent Laboratories (STL) Burlington in Colchester, Vermont for chemical analysis. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods utilized were according to the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). Sample and QC results were reported in 22 original and 1 reanalysis data packages.

Tables 1-1 and 1-2 summarize the groundwater and surface water samples collected during this sampling event, along with the analyses performed on each sample and the accompanying QC samples.

Table 1-1
Summary of Groundwater Samples Collected April 2004

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
002PUMPBACKDISCHARGE-T01N-GRW (WAT293C)	X	X	X	---	---	---
003CENTRALSEEP-T01N-GRW (WAT280C)	X	X	X	---	---	---
002PUMPBACK-T01N-GRW (WAT278C)	X	X	X	---	---	---
003EASTSEEP-T01N-GRW (WAT280C)	X	X	X	---	---	---
003WESTSEEP-T01N-GRW (WAT280C)	X	X	X	---	---	---
CAPULINSPRINGSOURCE-T01N-GRW (WAT289A)[2]	X	X	X	---	---	---
CAPULINSPRING-T01N-GRW (WAT288A)	X	X	X	---	---	---
CC1A-T01N-GRW (WAT292C)[2]	X	X	X	---	---	---
CC1B-T01N-GRW (WAT292C)[2]	X	X	X	---	---	---
CC2A-T01N-GRW (WAT292C)	X	X	X	---	---	---
CC2B-T01N-GRW (WAT292C)	X	X	X	---	---	---
CHAMBERSPRING-T01N-GRW (WAT293C) [2]	X	X	X	---	---	---
COLUMBINE01-T01N-GRW (WAT292C)	X	X	X	---	---	---
COLUMBINE02-T01N-GRW (WAT290A)	X	X	X	---	---	---
COLUMBINECANYON-T01N-GRW (WAT293C)	X, MS/D	X, MS/D	X, MS/D	---	---	---
COMPANYCABINSWELL-T01N-GRW (WAT280C)[2]	X	X	X	---	---	---
EASTSEEP-T01N-GRW (WAT279C)	X	X	X	---	---	---
EMBARGOROADSEEP-T01N-GRW (WAT280C)	X	X	X	---	---	---
EW-1-T01N-GRW (WAT274C)	X	X	X	---	---	---
EW-2-T01N-GRW (WAT276C)	X	X	X	---	---	---
EW-3-T01N-GRW (WAT276C)	X	X	X	---	---	---

Table 1-1
Summary of Groundwater Samples Collected April 2004

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
EW-4-T01N-GRW (WAT272C)	X	X	X	---	---	---
EW-5A-T01N-GRW (WAT272C)	X, FD	X, FD	X, FD	---	---	---
EW-5B-T01N-GRW (WAT272C)	X	X	X	---	---	---
EW-5C-T01N-GRW (WAT276C)	X	X	X	---	---	---
EW-5D-T01N-GRW (WAT277C)	X, MS/D	X, MS/D	X, MS/D	---	---	---
FAGERQUISTWELL-T01N-GRW (WAT281C)[2]	X, MS/D	X, MS/D	X, MS/D	---	---	---
GOATHILLSPRING-T01N-GRW (WAT289A)	X, FD	X, FD	X, FD	---	---	---
GOATHILLSPRINGSOURCE-T01N-GRW (WAT289A)[2]	X	X	X	---	---	---
GWW-1-T01N-GRW (WAT273A)[2]	X	X	X	---	---	---
GWW-2-T01N-GRW (WAT273A)[2]	X	X	X	---	---	---
GWW-3-T01N-GRW (WAT273A)[2]	X, MS/D	X, MS/D	X, MS/D	---	---	---
HANSENCREEK-T01N-SFW (WAT291A)	X	X	X	---	---	---
HANSEN-T01N-GRW (WAT290A)	X	X	X	---	---	---
HAUT-N-TAUT-T01N-GRW (WAT289A)	X	X	X	---	---	---
LABOBITA-T01N-GRW (WAT291A)	X	X	X	---	---	---
LABWELL-T01N-GRW (WAT281C)	X, FD	X, FD	X, FD	---	---	---
LOWERSPRING13-T01N-GRW (WAT273A)[2]	X, RB	X, RB	X, RB	---	---	---
LS1-T01N-GRW (WAT277C)	X	X	X	---	---	---
LS2-T01N-GRW (WAT277C)	X	X	X	---	---	---
LS3-T01N-GRW (WAT277C)	X	X	X	---	---	---
MINE1-T01N-GRW (WAT293C)	X	X	X	---	---	---
MMW-10A-T01N-GRW (WAT291A)[2]	X	X	X	---	---	---
MMW-10B-T01N-GRW (WAT293C)[2]	X	X	X	---	---	---
MMW-10C-T01N-GRW (WAT290A)[2]	X	X	X	---	---	---
MMW-11A-T01N-GRW (WAT290A)	X, FD	X, FD	X, FD	---	---	---
MMW-11-T01N-GRW (WAT291A)	X, RB	X, RB	X, RB	---	---	---
MMW-13-T01N-GRW (WAT293C)	X	X	X	---	---	---
MMW-17A-T01N-GRW (WAT288A)	X	X	X	---	---	---
MMW-17B-T01N-GRW (WAT288A)	X	X	X	---	---	---
MMW-18B-T01N-GRW (WAT287C)	X	X	X	---	---	---
MMW-19A-T01N-GRW (WAT284A)[2]	X	X	X	---	---	---
MMW-19B-T01N-GRW (WAT283C)[2]	X	X	X	---	---	---
MMW-21-T01N-GRW (WAT284A)	X, FD	X, FD	X, FD	---	---	---
MMW-22-T01N-GRW (WAT286A)	X	X	X	---	---	---
MMW-23A-T01N-GRW (WAT289A)[2]	X	X	X	---	---	---
MMW-23B-T01N-GRW (WAT287C)[2]	X	X	X	---	---	---
MMW-24-T01N-GRW (WAT 288A)	X, RB	X, RB	X, RB			
MMW-25B-T01N-GRW (WAT293C)	X, RB	X, RB	X, RB	---	---	---
MMW-27A-T01N-GRW (WAT290A)[2]	X, MS/D	X, MS/D	X, MS/D	---	---	---
MMW-28A-T01N-GRW (WAT274C)[2]	X	X	X	---	---	---
MMW-28B-T01N-GRW (WAT288A)	X	X	X	---	---	---
MMW-29A-T01N-GRW (WAT273A)	X	X	X	---	---	---
MMW-29B-T01N-GRW (WAT292C)	X	X	X	---	---	---

Table 1-1
Summary of Groundwater Samples Collected April 2004

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
MMW-2-T01N-GRW (WAT283C)[2]	X	X	X	---	---	---
MMW-30A-T01N-GRW (WAT283C)	X	X	X	---	---	---
MMW-30B-T01N-GRW (WAT283C)	X, RB	X, RB	X, RB	X, FD, MS/D, RB, FB	---	X, FD, MS/D, RB, FB
MMW-31A-T01N-GRW (WAT290A)	X	X	X	---	---	---
MMW-31B-T01N-GRW (WAT292C)	X	X	X	---	---	---
MMW-32A-T01N-GRW (WAT291A)[2]	X	X	X	---	---	---
MMW-32B-T01N-GRW (WAT293C)[2]	X	X	X	---	---	---
MMW-33A-T01N-GRW (WAT273A)[2]	X	X	X	---	---	---
MMW-34B-T01N-GRW (WAT286A)[2]	X	X	X	---	---	---
MMW-35B-T01N-GRW (WAT287C)[2]	X	X	X	---	---	---
MMW-36B-T01N-GRW (WAT290A)	X	X	X	---	---	---
MMW-38A-T01N-GRW (WAT286A)	X	X	X	---	---	---
MMW-39A-T01N-GRW (WAT290A)	X	X	X	---	---	---
MMW-3-T01N-GRW (WAT283C)[2]	X	X	X	---	---	---
MMW-40A-T01N-GRW (WAT287C)[2]	X	X	X	---	---	---
MMW-42A-T01N-GRW (WAT284A)[2]	X	X	X	---	---	---
MMW-42B-T01N-GRW (WAT283C)[2]	X	X	X	---	---	---
MMW-43A-T01N-GRW (WAT281C)[2]	X	X	X	---	---	---
MMW-44A-T01N-GRW (WAT290A)[2]	X	X	X	---	---	---
MMW-44B-T01N-GRW (WAT292C)[2]	X	X	X	---	---	---
MMW-45A-T01N-GRW (WAT284A)	X	X	X	---	---	---
MMW-45B-T01N-GRW (WAT284A)[2]	X	X	X	---	---	---
MMW-47A-T01N-GRW (WAT284A)[2]	X	X	X	---	---	---
MMW-48A-T01N-GRW (WAT284A)[2]	X, FD, MS/D, RB	X, FD, MS/D, RB	X, FD, MS/D, RB	X, FD, MS/D, RB, FB, **TPH***	X, FD, MS/D, RB, FB	---
MMW-49A-T01N-GRW (WAT273A)[2]	X	X	X	---	---	---
MMW-50A-T01N-GRW (WAT273A)[2]	X	X	X	---	---	---
MMW-7-T01N-GRW (WAT286A)	X	X	X	---	---	---
MMW-8A-T01N-GRW (WAT287C)[2]	X	X	X	---	---	---
MMW-8B-T01N-GRW (WAT287C)[2]	X	X	X	---	---	---
MW-10-T01N-GRW (WAT281C)	X	X	X	---	---	---
MW-11-T01N-GRW (WAT281C)	X	X	X	---	---	---
MW-12-T01N-GRW (WAT277C)	X, FD	X, FD	X, FD	---	---	---
MW-13-T01N-GRW (WAT278C)	X	X	X	---	---	---
MW-14-T01N-GRW (WAT276C)	X, FD	X, FD	X, FD	---	---	---
MW-15-T01N-GRW (WAT277C)	X, RB	X, RB	X, RB	---	---	---
MW-17-T01N-GRW (WAT278C)	X	X	X	---	---	---
MW-1-T01N-GRW (WAT272C)	X, MS/D	X, MS/D	X, MS/D	---	---	---
MW-20-T01N-GRW (WAT276C)	X	X	X	---	---	---
MW-20-T01N-GRW (WAT277C)	X	X	X	---	---	---
MW-21-T01N-GRW (WAT276C)	X	X	X	---	---	---
MW-22-T01N-GRW (WAT278C)	X	X	X	---	---	---
MW-23-T01N-GRW (WAT278C)	X	X	X	---	---	---
MW-24-T01N-GRW (WAT288A)	X	X	X	---	---	---
MW-25-T01N-GRW (WAT278C)	X	X	X	---	---	---

Table 1-1
Summary of Groundwater Samples Collected April 2004

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
MW-26-T01N-GRW (WAT279C)	X	X	X	---	---	---
MW-27-T01N-GRW (WAT283C)	X	X	X	---	---	---
MW-28-T01N-GRW (WAT279C)	X	X	X	---	---	---
MW-29-T01N-GRW (WAT279C)	X	X	X	---	---	---
MW-2-T01N-GRW (WAT281C)	X	X	X	---	---	---
MW-4-T01N-GRW (WAT272C)	X	X	X	---	---	---
MW-7A-T01N-GRW (WAT278C)	X	X	X	---	---	---
MW-7C-T01N-GRW (WAT281C)	X	X	X	---	---	---
MW-9A-T01N-GRW (WAT274C)	X, RB	X, RB	X, RB	---	---	---
MW-A-T01N-GRW (WAT277C)	X	X	X	---	---	---
MW-B-T01N-GRW (WAT276C)	X	X	X	---	---	---
MW-CH-T01N-GRW (WAT281C)	X	X	X	---	---	---
OUTFALL002PIPE-T01N-GRW (WAT277C)	X	X	X	---	---	---
OUTFALL002-T01N-GRW (WAT278C)	X	X	X	---	---	---
P-1-T01N-GRW (WAT288A)[2]	X	X	X	---	---	---
P-3-T01N-GRW (WAT289A)[2]	X, RB	X, RB	X, RB	---	---	---
P-4B-T01N-GRW (WAT288A)	X	X	X	---	---	---
P-5B-T01N-GRW (WAT288A)[2]	X	X	X	---	---	---
P-5C-T01N-GRW (WAT288A)	X	X	X	---	---	---
PR3-T01N-GRW (WAT287C)	X	X	X	---	---	---
SC-1A-T01N-GRW (WAT286A)	X	X	X	---	---	---
SC-1B-T01N-GRW (WAT287C)	X	X	X	---	---	---
SC-2B-T01N-GRW (WAT287C)	X	X	X	---	---	---
SC-3A-T01N-GRW (WAT286A)	X	X	X	---	---	---
SC-3B-T01N-GRW (WAT286A)	X	X	X	---	---	---
SC-4A-T01N-GRW (WAT286A)	X	X	X	---	---	---
SC-5A-T01N-GRW(WAT289A)	X	X	X	---	---	---
SC-5B-T01N-GRW (WAT287C)	X	X	X	---	---	---
SC-6A-T01N-GRW (WAT289A)	X	X	X	---	---	---
SC-7A-T01N-GRW (WAT289A)	X	X	X	---	---	---
SC-8A-T01N-GRW (WAT293C)	X	X	X	---	---	---
SPRING10-T01N-GRW (WAT279C)	X	X	X	---	---	---
SPRING12A-T01N-GRW (WAT280C)	X	X	X	---	---	---
SPRING12-T01N-GRW (WAT280C)	X	X	X	---	---	---
SPRING13PUMP-T01N-GRW (WAT273A)	X	X	X	---	---	---
SPRING13-T01N-GRW (WAT273A)[2]	X	X	X	---	---	---
SPRING14MA-T01N-GRW (WAT291A)	X	X	X	---	---	---
SPRING14M-T01N-GRW (WAT291A)[2]	X	X	X	---	---	---
SPRING14T-T01N-GRW (WAT280C)	X	X	X	---	---	---
SPRING15T-T01N-GRW (WAT279C)	X	X	X	---	---	---
SPRING17-T01N-GRW (WAT279C)	X, MS/D	X, MS/D	X, MS/D	---	---	---
SPRING18-T01N-GRW (WAT279C)	X	X	X	---	---	---
SPRING39PUMP-T01N-GRW (WAT273A)	X	X	X	---	---	---
SPRING9A-T01N-GRW (WAT279C)	X	X	X	---	---	---

Table 1-1
Summary of Groundwater Samples Collected April 2004

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives
SPRING9-T01N-GRW (WAT279C)	X	X	X	---	---	---
SUMP5000-T01N-GRW (WAT274C)	X	X	X	---	---	---
US-1-T01N-GRW (WAT272C)	X, MS/D	X, MS/D	X, MS/D	---	---	---
US-2-T01N-GRW (WAT272C)[2]	X	X	X	---	---	---
US-3-T01N-GRW (WAT272C)	X	X	X	---	---	---
WALDOSPRING-T01N-GRW (WAT288A)	X	X	X	---	---	---
WESTSEEP-T01N-GRW (WAT281C)	X	X	X	---	---	---
Number GW samples	159	159	159	2	1	1
Number MS/MSD or MS/LD	9	9	9	2	1	1
Number Field Duplicates	8	8	8	2	1	1
Number Rinsate Blanks	9	9	9	2	1	1
Number Field Blanks	---	---	---	2	1	1

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

[2]Sample also analyzed by the University of Arizona for stable isotopes of water; samples from six other locations not listed in this table were also analyzed for stable isotopes of water.

MS/D = Matrix Spike/Laboratory Duplicate for inorganics, Matrix Spike/Matrix Spike Duplicate for organics

FD = Field Duplicate RB = Rinsate Blank FB = Field Blank

TPH* analyzed for sample MMW-48A-T01N-GRW (WAT 284A) only.

Table 1-2
Summary of Surface Water Samples Collected April 2004

Sample Identification	Total Metals	Dissolved Metals	Inorganics	TPH (DRO)	BOD/COD
CAPULIN1-T01N-SFW (WAT285SA)	X	X	X	---	X
DECANT-T01N-SFW (WAT282C)	X	X	X	X, FD, RB, MS/D	X
HANSENCREEK-T01N-SFW (WAT285S)	X	X	X	---	X
RR-10A1-T01N-SFW (WAT285S)	X	X	X	---	X
RR-10-T01N-SFW (WAT285S)	X	X	X	---	X
RR-11A1-T01N-SFW (WAT285S)	X	X	X	---	X
RR-11C-T01N-SFW (WAT285S)	X	X	X	---	X
RR-12-T01N-SFW (WAT285S)[2]	X	X	X	---	X
RR-13-T01N-SFW (WAT285S)[2]	X	X	X	---	X
RR-14-T01N-SFW (WAT285S)	X	X	X	---	X
RR-16-T01N-SFW (WAT285S)	X	X	X	---	X
RR-7-T01N-SFW (WAT285S)	X	X	X	---	X
RRDS-SPRING13-T01N-SFW (WAT 275S)	X, FD	X, FD	X, FD	---	X, FD
RRDS-SPRING39-T01N-SFW (WAT 275S)	X	X	X	---	X
RRUS-SPRING13-T01N-SFW (WAT 275S)	X, MS/D	X, MS/D	X, MS/D	---	X, MS/D
RRUS-SPRING39-T01N-SFW (WAT275S)	X, RB	X, RB	X, RB	---	X, RB
Number SFW samples	16	16	16	1	16
Number MS/MSD or MS/LD	1	1	1	1	1
Number Field Duplicates	1	1	1	1	1
Number Rinsate Blanks	1	1	1	1	1

FD = Field Duplicate MS/D = Matrix Spike/Laboratory Duplicate RB = Rinsate Blank

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

[2]Sample also analyzed by the University of Arizona for stable isotopes of water; sample RR-11B-T01N-SFW (not included in the table) was analyzed for only stable isotopes of water.

The data review process evaluated sample-specific and laboratory performance criteria in accordance with the standard operating procedure (SOP) 12.1. As mentioned in the SOP, all RI/FS data generated for the Questa Mine received an evaluation of sample-specific parameters. In addition, 10% of the data packages (per analysis type per event/episode) were reviewed for laboratory performance parameters. The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Sample-specific reviews evaluated the following sample related parameters:

- Case narrative comments
- Chain-of-Custody/Sample Receipt
- Holding Times
- Method Blank (Preparation Blank)
- Matrix-Dependent Quality Control
  - Matrix Spike Analysis
  - Laboratory duplicate Analysis
- Method-Specific Quality Control Measures
- Inorganic Method Specific QC Measures
  - Post Digestion Spike Analysis
  - ICP Serial Dilution Tests
  - Internal Standard Performance
  - Cation/Anion Balance Evaluation
- Organic Method Specific QC Measures
  - Surrogate Spike Compound Recovery
  - Internal Standards
- Total versus Partial Balance
- Field quality control samples
  - Field Duplicate Agreement
  - Rinsate Blank Results
  - Field Blank Results
  - Trip Blank Results

Evaluation of laboratory performance parameters provided an overall representation of the analytical system at the time the samples were analyzed. The laboratory performance review evaluated parameters in control of the laboratory, but independent of the field samples analyzed, as follows:

- Initial Calibration
- Continuing Calibration Verification
- Laboratory Control Sample Analysis
- Compound Identification
- Target Analyte Quantification
- Verification
- Method Specific Quality Control Checks

If any potential systematic problems were determined upon review of the laboratory performance parameters in any of the selected packages evaluated (meeting the 10% criteria), the review parameter was evaluated in all data packages for April 2004 to determine the need for data qualification. Instances, in which professional judgment was exercised in evaluating the need for data qualification, the basis for this rationale was provided in the data review summary.

Upon completion of the sample-specific reviews and laboratory performance reviews, a collective assessment for the event was performed. Site-specific matrix spike, laboratory duplicate, serial dilution, blank (field and rinsate), and field duplicate results were assessed collectively by matrix per event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered more representative of the site sample matrix and a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 3.0 describes sample specific data review findings and several data quality issues affecting all of the water packages. Section 4.0 presents the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Section 5.0 summarizes the collective summary of the field QC results (field and rinsate blanks, when applicable, and field duplicate results) and the resultant sample qualification. Lastly, an overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

Attachment 1 includes all individual data review summaries for data packages WA272C through WAT293C, for a total of 22 original data packages and one reanalysis package (WAT285SA). In order to attain the frequency requirements for laboratory performance reviews, a total of three data packages (WAT287C, WAT283C, and WAT284A) were evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.1 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were identified which globally affected all relevant water samples analyzed for the April 2004 Groundwater and Surface Water event**.** Although most of the issues have been addressed in the individual summary reports, these common issues and conclusions are summarized below:

3.1.1 Holding Blanks

For the analysis of the volatile organic samples, a holding blank was carried through the sample storage period and analyzed in the same sequence as the samples in the data package. As all holding blank recoveries were all nondetect, the indication of the occurrence of potential cross-contamination during sample storage was unlikely.

3.1.2 Manual Integration

Manual integration was employed in deriving results for the volatile and semivolatile organics in a few data packages. The values that were derived from manual integration were qualified on the quantitation reports and extracted ion current profiles were included for each instance. The supporting documentation provided was reviewed and found to be adequate.

3.1.3 Low-Level Detections

Detected organic analytes with concentrations between the Method Detection Limit (MDL) and the Reporting Limit (RL) were qualified as estimated (J). A qualifier code of “SQL-I” (Sample Quantitation Limit) was assigned to reflect the greater uncertainty in quantitative values below the RL.

3.1.4 TICs Reported in Blanks

Several Tentatively Identified Compounds (TICs) were reported as present in the semivolatile blanks for each package in which semivolatile data were analyzed. TICs in method blanks are considered to be reportable as TICs for samples and such identifications were rejected, flagged as unusable (R). The multiple unknown compounds not detected in the method blank were qualified as (NJ) to not the analyses indicated the presence of an analyte that had been “tentatively identified” and the associated numerical value represented its approximate value.

3.1.5 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

3.1.6 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilbria were found to affect the matrix spike recoveries more than the expected accuracy of the analyses. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assess for accuracy of the analysis.

3.1.7 Non-Valid Matrix Spikes

There were a total of three scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. First, when native sample concentrations were greater than or equal to four times the spiking concentration, the ability to determine accuracy in the analysis was not accurate as the difference in the spike level with the original analyte concentration was not so discernable due to high concentration levels. In addition, there were several instances in which the reporting limits for various metal analytes were increased due to dilution factors, which affected the reliable quantitation of several spiked metals. In these situations, the reporting limit was greater than the spike concentration added. Related to this scenario, is the last instance in which the difference between the RL concentration and the spike concentration was less than the RL value.

3.1.8 Laboratory Performance Review (LPR) Findings

As mentioned previously, four data packages were given a full validation to assess the performance of the laboratory for all analyses. Any findings resulting in data qualification were examined in all other April 2004 groundwater and surface water packages to determine if data qualification would be extended to these additional packages. The following parameters were evaluated in all other data packages.

- Continuing Calibration Verification (CCV) results were reviewed in all packages. No additional data qualification resulted, as all recoveries were either within the acceptance recovery range of 90-110% or were not applicable to any of the samples in the sequence run.

Only data packages WAT284A, WAT286A, and WAT287C contained samples qualified on the basis of CCV recoveries.

- Initial and Continuing Calibration (ICAL and CCAL) results were reviewed for all organic analyses. Field samples MMW-48A-T01N-GRW and MMW-48A-T01D-GRW, in addition to field QC samples associated with these calibration events (FB02T-GRW, RB02T-GRW, and RB02T-GRW) were qualified for several volatile analytes as estimated (J/UJ). No additional sample results were qualified on the basis of ICAL or CCAL results outside the acceptance criteria.

Inorganic parameter matrix QC consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. Organic parameter QC consisted of matrix spike/matrix spike duplicate (MS/MSD) analyses. The site-specific matrix QC results were assessed collectively for the April 2004 Groundwater and Surface Water Sampling Event by matrix (groundwater versus surface water, and total versus dissolved fractions) to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.3 present the collective matrix QC results associated with the samples in this event and the resultant data qualifiers.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent quality control (QC) samples were used to evaluate how the sample matrix affected the accuracy and precision of the analytical results. Nine groundwater field samples were designated for both total/dissolved metals, and inorganics matrix spike analyses. Two groundwater field samples were designated for semivolatile, volatile, and explosives organics matrix spike analyses. One surface water field sample was designated for total/dissolved, and inorganic matrix spike analyses, as summarized in Table 4-1. Table 4-2 summarizes the breakdown of frequency requirements for each of the analyses per groundwater and surface water for the April 2004 Groundwater and Surface Water Sampling Event.

Table 4-1
Field Samples Designated for Matrix QC Analysis

Sample ID	Analyses						
	Total Metals	Dissolved Metals	Inorganics	VOCs	SVOCs	Explosives	BOD/ COD
GROUNDWATER							
COLUMBINECANYON-T01N-GRW (WAT293C)	X	X	X	---	---	---	---
EW-5D-T01N-GRW (WAT277C)	X	X	X	---	---	---	---
FAGERQUISTWELL-T01N-GRW (WAT281C)	X	X	X	---	---	---	---
GWW-3-T01N-GRW (WAT273A)	X	X	X	---	---	---	---
MMW-27A-T01N-GRW (WAT290A)	X	X	X	---	---	---	---
MMW-30B-T01N-GRW (WAT283C)	---	---	---	X	---	X	---
MMW-48A-T01N-GRW (WAT284A)	X	X	X	X	X	---	---
MW-1-T01N-GRW (WAT272C)	X	X	X	---	---	---	---
SPRING17-T01N-GRW (WAT279C)	X	X	X	---	---	---	---
US-1-T01N-GRW (WAT272C)	X	X	X	---	---	---	---
SURFACE WATER							
DECANT-T01N-SFW (WAT282C)	---	---	---	**TPH** *(DRO)	---	---	---
RRUS-SPRING13-T01N-SFW (WAT275S)	X	X	X	---	---	---	X

*TPH (DRO) analyzed for the matrix spike for the only sample analyzed for this parameter.

Table 4-2
Frequency Requirements for Matrix QC

Analyses	# MS Samples	Total # Samples	Percentage (%)
GROUNDWATER			
Total Metals	9	159	5.7
Dissolved Metals	9	159	5.7
Inorganics	9	159	5.7
VOC	2	2	100
SVOC	1	1	100
Explosives	1	1	100
SURFACE WATER			
Total Metals	1	16	6.3
Dissolved Metals	1	16	6.3
Inorganics	1	16	6.3
TPH (DRO)	1	1	100
BOD/COD	1	16	6.3

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses.

In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the number of valid spikes relative to the size of the sample set, and the magnitude of outages.

4.1.1 Organic Matrix Spike Results

Table 4-3 summarizes the average matrix recoveries for organic target analytes (VOC, SVOCs, TPH, and Explosives), recovered outside the laboratory's historical limits resulting in qualification of data results.

Table 4-3
Organics Matrix Spike Results

Analyte	Fraction	Historical Laboratory Recovery	Average % Recovery	Action
2- Chloroethyl Vinyl Ether	VOC	60-140	0	**R** MS-L parent and duplicate sample results
Xylene (m,p)	VOC	78-116	74	UJ MS-L parent and field duplicate sample results
Xylene (o)	VOC	81-125	75	
Styrene	VOC	80-124	45.5	
Bromoform	VOC	82-120	67	
1,3,5- Trimethylbenzene	VOC	72-112	64	

All matrix spike recoveries for organics analyses (VOCs, SVOCs, TPH, and Explosives) were within the historical acceptance range, or otherwise considered an acceptable recovery (between 75-125%), with the exception of the six volatile organic compounds summarized above. Qualification of organic data results on the basis of matrix spike recoveries was limited to the parent sample and its field duplicate.

4.1.2 Inorganic Matrix Spike Results

A number of matrix spike recoveries were outside of the acceptance limits of 75-125% for both inorganics and metals. Tables 4-4 and 4-5 summarize the results for each analyte, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 4-4
Inorganics Matrix Spike Results

Analyte	Number of Valid Spikes/ Total Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
INORGANICS GROUNDWATER					
Chloride	9/9	0	0	110.8	None
Nitrate	9/9	0	0	97.1	None
Fluoride	9/9	0	0	94.7	None
Ammonia	9/9	**1**	0	79.7	J MS-L to parent sample
TKN	9/9	0	0	95.9	None
Nitrite	9/9	0	0	101.2	None
Ortho-phosphate	9/9	0	0	98.4	None
Phosphorus	9/9	0	0	100.1	None
Sulfate	9/9	**1**	0	87	J MS-L to parent sample
TOC	9/9	**2**	**3**	94.6	J/UJ MS-I to all TOC sample results
INORGANICS SURFACE WATER					
Chloride	1/1	0	0	104	None
Nitrate	1/1	0	0	110	None
Fluoride	1/1	0	0	93	None
Ammonia	1/1	**1**	0	73	J MS-L to parent sample
TKN	1/1	0	0	95	None
Nitrite	1/1	0	0	106	None
Ortho-phosphate	1/1	0	0	99	None
Phosphorus	1/1	0	0	103	None
Sulfate	1/1	0	0	93	None
TOC	1/1	0	**1**	180	J MS-H to parent sample
BOD_5	1/1	0	0	105	None
COD	1/1	0	0	98	None

With the exception of TOC, data qualification was limited to the parent samples only. Qualification was extended to all TOC results for groundwater samples, as 56% (5/9) of the TOC matrix spike results were recovered outside the acceptance range of 75-125%. Groundwater TOC results were qualified as estimated (J/UJ) with an indeterminate bias direction assigned, as of the five matrix spike results recovered outside the acceptance range, three were in excess of 125%, whereas two were below 75%.

Table 4-5
Metals Matrix Spike Results

Analyte	Total				Dissolved				Action
	# Valid	%R <75%	%R > 125%	Avg %R	# Valid	%R <75%	%R > 125%	Avg %R	
METALS GROUNDWATER									
Aluminum	6	0	0	104.4	6	0	0	105.8	None
Antimony	9	0	0	103.5	9	0	0	101.8	
Arsenic	9	**1**	0	93.3	9	**2**	0	93	**J/UJ MS-L** to parent samples
Barium	9	0	0	98.4	9	0	0	99	None
Beryllium	9	0	0	102.3	9	0	0	104.6	
Boron	9	0	0	102.7	9	0	0	101.4	
Cadmium	9	0	**2**	114.9	9	0	**3**	120.2	Positive sample results qualified **J MS-H;** ND (NQ)
Chromium	9	0	0	103.4	9	0	0	102.4	None
Cobalt	9	0	**1**	108.5	9	0	0	103.5	Positive parent sample results qualified **J MS-H**; ND (NQ)
Copper	9	0	0	106.3	9	0	**1**	105.4	Positive parent sample results qualified **J MS-H**; ND (NQ)
Iron	8	**3**	0	74.6	8	**1**	**1**	101.3	**J/UJ MS-L** to all sample results
Lead	9	0	0	104.6	9	0	0	104.4	None
Manganese	6	0	0	104.6	7	0	0	105.9	
Mercury	9	0	0	96.4	9	0	0	100.4	
Molybdenum	9	0	0	101.3	9	0	0	104.1	
Selenium	9	0	**2**	110.7	9	0	**2**	108.3	Positive parent sample results qualified **J MS-H;** ND (NQ)
Nickel	9	0	0	103.9	9	0	0	103.8	None
Thallium	9	0	0	105.3	9	0	0	104.6	
Silver	9	0	0	99.8	9	0	0	99.2	
Vanadium	9	0	0	102.2	9	0	0	104.2	
Zinc	7	0	0	107.9	8	0	0	107.7	
Cyanide	9	**2**	0	85.1	//	//	//	//	**J/UJ MS-L** to parent samples
METALS SURFACE WATER									
Aluminum	1	0	0	109	1	0	0	106.6	None
Antimony	1	0	0	99.4	1	0	0	101.8	
Arsenic	1	0	0	100.6	1	0	0	100.7	
Barium	1	0	0	103.3	1	0	0	104.2	
Beryllium	1	0	0	106.8	1	0	0	108.1	
Boron	1	0	0	102.2	1	0	0	103.1	
Cadmium	1	0	0	100.7	1	0	0	102.2	
Chromium	1	0	0	104.7	1	0	0	105.8	

Table 4-5
Metals Matrix Spike Results

Analyte	Total				Dissolved				Action
	# Valid	%R <75%	%R > 125%	Avg %R	# Valid	%R <75%	%R > 125%	Avg %R	
Cobalt	1	0	0	102.6	1	0	0	103.4	
Copper	1	0	0	108.5	1	0	0	107.1	
Iron	1	0	0	107.7	1	0	0	107.8	
Lead	1	0	0	109.4	1	0	0	109.4	
Manganese	1	0	0	104.5	1	0	0	105.6	
Mercury	1	0	0	93.4	1	0	0	97.7	
Molybdenum	1	0	0	104.2	1	0	0	106.2	
Selenium	1	0	0	87.3	1	0	0	90.3	
Nickel	1	0	0	110.4	1	0	0	108.5	
Thallium	1	0	0	110.1	1	0	0	109.8	
Silver	1	0	0	106	1	0	0	105.2	
Vanadium	1	0	0	106.2	1	0	0	106.2	
Zinc	1	0	0	103.8	1	0	0	104.7	
Cyanide	1	0	0	88.7	//	//	//	//	

// Cyanide was not analyzed for dissolved metal fractions
Qualifications which resulted are in bold type

Data qualification of metal results on the basis of matrix spike recoveries was limited to the parent samples, with the exception of dissolved cadmium and total iron results. Thirty-three percent (3/9) of the dissolved fraction groundwater cadmium matrix spike results were recovered in excess of the acceptance criteria, with an average percent recovery of 120.2%. Accordingly, qualification as estimated for positive dissolved cadmium results was extended to all groundwater samples, with a potential high bias assigned. Qualification of nondetect results in conjunction with a high bias was not necessary. Thirty-eight percent (3/8) of the iron results for total fraction groundwater samples were recovered below the lower acceptance range of 75%, with an average % recovery of 74.6% for all eight samples. Accordingly, total iron results for groundwater samples were qualified as estimated (J/UJ) with a low bias direction assigned. Despite the fact that 25% of iron results for dissolved fraction samples were recovered outside the acceptance range, the average percent recovery of 101.3% was well within the criterion and therefore did not warrant qualification of iron results in dissolved fraction groundwater samples. As indicated in the summary tables, the accuracy of the analyses relative to the site-specific matrix was generally acceptable as few recoveries were out and most average recoveries were within limits.

4.1.3 Post-Digestion Spikes

Post-digestion spikes were conducted on all ICP and ICP/MS analytes to determine whether matrix recoveries outside of the acceptance range were the result of sample matrix, or due to a bias in the analytical system. All post digestion recoveries for those analytes recovered outside of the acceptance range were reviewed and recovered within the range of 75-125%. Therefore, no qualification of data was assigned for any of the metal analytes on the basis of post-digestion spike recovery, as it was likely that all matrix spike exceedances were due to a matrix effect on digestion rather than a bias in the analytical system.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Laboratory duplicate sample results were evaluated to assess the precision of the laboratory analyses. Eight groundwater samples and one surface water sample were designated for metals, dissolved metals, and inorganic parameters laboratory duplicate analysis. The evaluation criteria used are summarized in SOP 12.1. For metals, the Contract Laboratory (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

As all samples designated for matrix spike analyses (MS) were also designated for either a matrix spike duplicate (MSD) or laboratory duplicate (LD) analysis, the sample frequency for the analyses of laboratory duplicates is the same as summarized in Table 4-2.

The following table summarizes the laboratory duplicate results for any of the metals or inorganics analytes, which exhibited disagreements in concentrations resulting in the data qualification in the parent samples.

Table 4-6
Inorganic Laboratory Duplicate Results

Analyte	Sample ID	Criterion	Criterion Exceedances	Action
INORGANICS				
Phosphorus	MMW-27A-T01N-GRW (WAT290A)	|Diff| <1xRL	1.8xRL	Parent sample results qualified J D-I

With one exception, the RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within the QAPP acceptance limits. Qualification was not extended to any other samples, as the overall level of precision demonstrated is considered to be acceptable.

4.3 ICP SERIAL DILUTION RESULTS

ICP serial dilutions were performed on metal samples in every data package. These analyses were run on the same samples as were designated for QC analyses, or otherwise selected in data packages in which there were no QC samples. These analyses were used to evaluate whether or not significant physical or chemical interferences existed due to sample matrix. This was accomplished by analyzing the sample and a five-fold dilution of the sample. The percent difference (%D) between these two concentrations was compared to an acceptance criterion of $\leq$10%, only for those analytes for which the serial dilution analysis was applicable. Analytes were applicable if the initial concentrations were sufficiently higher (50x) than the IDL, accounting for dilution. Generally, the diluted result is considered more accurate as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result. The following table summarizes each sample utilized for a serial dilution analysis, along with the associated applicable analytes, and the analytes for which qualification in the parent sample was necessary (designated with bold text).

Qualifications were generally limited to the parent samples if less than a quarter of the valid serial dilution results were outside of the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set and the magnitude of outages were also taken into consideration. Evaluation of the serial dilution results collectively did not result in any additional qualification of results. The analysis was considered to be in control and did not indicate a pervasive matrix analytical problem. Table 4-7 summarizes the average % Ds for each of the analytes, broken down into total and dissolved fractions, along with the percent of applicable analytes that exceeded control criteria (10%).

Table 4-7
ICP Serial Dilution Results

Sample ID	Applicable Analytes (%D>10% in bold)
GROUNDWATER –DISSOLVED FRACTION	
MW-1-D01N-GRW (WAT272C)	Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Mg, Mn, Mo, Ni, Tl, Ag, V, Zn
US-1-D01N-GRW (WAT272C)	Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Mg, Mo, Ni, Tl, Ag, V, **Zn (10.8)**
GWW3-D01N-GRW (WAT273A)	Ba, Mn, Mo
EW-5D-D01N-GRW (WAT277C)	Sb, As, Ba, Be, B, **Cd (11.3),** Ca, Cr, Co, Cu, Mg, Mn, Mo, Ni, Tl, Ag, V
SPRING13-D01N-GRW (WAT279C)	Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Mn, Mo, Ni, Ag, Zn
FAGERQUISTWELL-D01N-GRW (WAT281C)	Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Mn, Mo, Ni, Ag, Zn
MMW-48A-D01N-GRW (WAT284A)	Ba, Be, B, Mn, Mo
MMW-27A-D01N-GRW (WAT290A)	Ba
COLUMBINECANYON-D01N-GRW (WAT293C)	As, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Tl, Ag, V
GROUNDWATER –TOTAL FRACTION	
MW-1-T01N-GRW (WAT272C)	Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Mg, Mn, Mo, Ni, Tl, Ag, V, Zn
US-1-T01N –GRW (WAT272C)	Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Mn, Mo, Ni, Ag, V, Zn
GWW-3-T01N-GRW (WAT273A)	Ba, Mn, Mo
MMW-28A-T01N-GRW (WAT274C)	Ca
MW-21-T01N-GRW (WAT276C)	Ca, Mg
EW-5D-T01N-GRW (WAT277C)	Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Mg, Mn, Mo, Ni, Tl, Ag, V
002PUMPBACK-T01N-GRW (WAT278C)	Ca, Mg, Mn, Mo
SPRING13-T01N-GRW (WAT279C)	Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Mn, Mo, Ni, Tl, **Ag (11.7)**
SPRING14T-T01N-GRW (WAT280C)	---
FAGERQUISTWELL-T01N-GRW (WAT281C)	Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Mn, Mo, Ni, Ag, V
MMW-30A-T01N-GRW (WAT283C)	Ca, Mg, Mn
MMW-48A-T01N-GRW (WAT284A)	Ba, Be, B, Mo
SC-3B-T01N-GRW (WAT286A)	Mn
MMW-8A-T01N-GRW (WAT287C)	Ca, Mg, Mn, K
P-5C-T01N-GRW 9WAT288C)	Mn
GOATHILLSPRING-T01N-GRW (WAT289A)	Al, **Be (20),** Fe, Mg, Mn, Zn
MMW-27A-T01N-GRW (WAT290A)	Ba, Mn, Mo
MMW-11-T01N-GRW (WAT291A)	Mn

Table 4-7
ICP Serial Dilution Results

Sample ID	Applicable Analytes (%D>10% in bold)
MMW-31B-T01N-GRW (WAT292C)	Al, Be, **Cd (10.5),** Ca, **Co (11.4),** Pb, Mg, Mn, **Ni (11.4),** Zn
COLUMBINECANYON-T01N-GRW (WAT293C)	Sb, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Tl, Ag, V
SURFACE WATER-DISSOLVED FRACTION	
RRUS-SPRING13-T01N-SFW (WAT275S)	Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mn, Mo, Ni, Tl, Ag, V, Zn
SURFACE WATER-TOTAL FRACTION	
RRUS-SPRING13-T01N-SFW (WAT275S)	Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mn, Mo, Ni. Tl, Ag, V, Zn
DECANT- TOIN-SFW (WAT282C)	A, Ba, Ca, Fe, Mg, Mn, Ni, Mo, K, Na
CAPULIN1-T01N-SFW (WAT285SA)	Mn
RR-11A1-T01N-SFW (WAT285S)	Ca, Mg, Mn

---Indicates the serial dilution was not applicable to any of the metal analytes.

Table 4-8 summarizes the average % D for each analyte, the number of serial dilution results that were considered valid and in excess of 10%, and the resultant qualifiers based on the collective assessment.

Table 4-8
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	# of Valid Results	#Ds >10%	Avg. %D	% Valid Result >10%	# of Valid Results	#Ds >10%	Avg. %D	% Valid Result >10%	
GROUNDWATER									
Aluminum	3	0	4.0	0	1	0	5.7	0	None
Antimony	6	0	5.4	0	6	0	4.5	0	
Arsenic	4	0	---	---	4	0	6.9	0	
Barium	8	0	6.1	0	9	0	0.9	0	
Beryllium	9	**1**	10.4	11.1	7	0	1.5	0	J/UJ DL-L to parent sample
Boron	6	0	0.0	0	6	0	3.1	0	None
Cadmium	7	0	5.4	0	6	**1**	1.8	16.7	J/UJ DL-L to parent sample
Calcium	9	0	0.8	0	3	0	0.9	0	None
Chromium	6	0	1.5	0	6	0	1.8	0	
Cobalt	7	**1**	6.3	14.3	6	0	1.6	0	J/UJ DL-L to parent sample
Copper	6	0	4.7	0	6	0	1.8	0	None
Iron	1	0	3.8	0	0	0	---	0	
Lead	2	0	5.6	0	1	0	3.1	0	
Magnesium	8	0	2.3	0	3	0	---	0	
Manganese	16	0	1.7	0	7	0	1.6	0	
Molybdenum	10	0	5.5	0	8	0	2.2	0	
Nickel	7	**1**	6.1	14.3	6	0	1.5	0	J/UJ DL-L to parent sample

Table 4-8
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	# of Valid Results	#Ds >10%	Avg. %D	% Valid Result >10%	# of Valid Results	#Ds >10%	Avg. %D	% Valid Result >10%	
Potassium	0	0	---	---	0	0	---	0	None
Selenium	0	0	---	---	0	0	---	0	
Silver	6	0	3.0	0	6	0	6.8	0	
Sodium	0	0	---	---	0	0	---	0	
Thallium	4	0	1.1	0	5	0	0.4	0	
Vanadium	5	0	1.5	0	6	**1**	4.6	16.7	J/UJ DL-L to parent sample
Zinc	4	0	4.5	0	2	**1**	7.3	50	
SURFACE WATER									
Aluminum	1	0	2.5	0	1	0	8.7	0	None
Antimony	1	0	7.4	0	1	0	5.9	0	
Arsenic	1	0	7.7	0	1	0	9.6	0	
Barium	1	0	1.7	0	1	0	6.9	0	
Beryllium	1	0	1.9	0	1	0	5.7	0	
Boron	1	0	5.4	0	1	0	9.5	0	
Cadmium	1	0	8.4	0	1	0	3.0	0	
Calcium	1	0	1.6	0	1	0	6.2	0	
Chromium	1	0	0.8	0	1	0	6.3	0	
Cobalt	1	0	2.2	0	1	0	7.1	0	
Copper	1	0	0.2	0	1	0	0.7	0	
Iron	1	0	0.8	0	1	0	1.3	0	
Lead	1	0	1.9	0	1	0	0.9	0	None
Magnesium	0	0	---	---	0	0	---	---	
Manganese	1	0	1.9	0	1	0	6.6	0	
Molybdenum	1	0	1.3	0	1	0	1.5	0	
Nickel	1	0	1.2	0	1	0	1.2	0	
Potassium	0	0	---	---	0	0	---	---	
Selenium	0	0	---	---	0	0	---	---	
Silver	1	0	1.5	0	1	0	1.9	0	
Sodium	0	0	---	---	0	0	---	---	
Thallium	1	0	2.8	0	1	0	1.4	0	
Vanadium	1	0	2.0	0	1	0	2.1	0	
Zinc	1	0	4.7	0	1	0	9.0	0	

Groundwater Discussion

For analytes beryllium (T), cobalt (T), nickel (T), cadmium (D), and vanadium (D), fewer than 25% of the applicable serial dilution results had %Ds greater than 10%. It was therefore only considered necessary to qualify sample results in the parent samples. Of two applicable serial dilution results for zinc (D), one was marginally in excess of 10% (10.8%). Due to the fact that the average %D for zinc (D) was low (7.3%), qualification was also limited to the parent sample.

Surface Water Discussion

None of the applicable serial dilution results were in excess of 10%. Accordingly, none of the surface water sample results were qualified on the basis of serial dilutions.

Site-specific field duplicate samples, rinsate blanks, and field blanks were assessed collectively by matrix for the April 2004 Groundwater and Surface Water Sampling Event to determine the need for qualification of sample results of similar matrices. The sections to follow summarize the results for these QC samples and any collective qualifications arising from the assessments.

5.1 FIELD DUPLICATE AGREEMENT

The field duplicate agreement assessment evaluated the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, as follows. When both concentration results were sufficiently greater (5x) the CRDL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤30%. If one or both of the concentration results were less than 5x the CRDL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤2x the CRDL. The breakdown of field duplicate pair samples per analysis and fraction can be referenced in Table 5-1. Table 5-2 summarizes the sample sites, which were duplicated and notated as field duplicate samples, per parameter.

Table 5-1
Summary of Field Duplicate Samples Collected April 2004

Sample ID	Analyses					
	Total Metals	Dissolved Metals	Inorganics	VOCs	SVOCs	Explosives
EW-5A-T01N/T01D-GRW (WAT272C)	X	X	X	---	---	---
GOATHILLSPRING-T01N/T01D-GRW (WAT289A)	X	X	X	---	---	---
LABWELL-T01N/T01D-GRW (WAT281C)	X	X	X	---	---	---
MMW-11A-T01N/T01D-GRW (WAT290A)	X	X	X	---	---	---
MMW-30B-T01N/T01D-GRW (WAT283C)	---	---	---	X	---	X
MMW-48A-T01N/T01D-GRW (WAT284A)	X	X	X	X	X	---
MW-12-T01N/T01D-GRW (WAT277C)	X	X	X	---	---	---
MW-14-T01N/D-GRW (WAT276C)	X	X	X	---	---	---
RRDS-SPRING13-T01N/T01D-SFW (WAT275S)	X	X	X	---	---	---

Table 5-2
Field Duplicate Collection Frequency for the April 2004 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
GROUNDWATER			
Total Metals	8	159	5.0
Dissolved Metals	8	159	5.0
Inorganics	8	159	5.0
VOC	2	2	100
SVOC	1	1	100
Explosives	1	1	100

Table 5-2
Field Duplicate Collection Frequency for the April 2004 Sampling Event

Analyses	Number of FD samples	Total Samples	Percentage (%)
SURFACE WATER			
Total Metals	1	16	6.3
Dissolved Metals	1	16	6.3
TPH (DRO)	1	1	100
BOD/COD	1	16	6.3

Table 5-3
Summary of Field Duplicate Sample Exceedances

Analyte	Sample ID	Criterion	Criterion Exceedances	Action
SURFACE WATER				
PETN	MMW-30B-T01N/D-GRW (WAT283C)	|Diff| ≤2xRL	|Diff| =2.2xRL	J FD-I for affected field duplicate samples only
TSS	MMW-48A-T01N/D-GRW (WAT284A)	RPD ≤35%	RPD = 34	All GRW results for TSS qualified J/UJ FD-I
TSS	GOATHILLSPRING-T01N/D-GRW (WAT289A)	RPD ≤35%	RPD = 89	
Chloride			RPD = 70	J FD-I for affected field duplicate samples only
Nitrite		|Diff| ≤2xRL	|Diff| =11.4xRL	
Orthophosphate			|Diff| =25.3xRL	
TSS	MMW-11A-T01N/D-GRW (WAT290A)		|Diff| =2.4xRL	All GRW (total) results for TSS qualified J/UJ FD-I

\|Diff\| = Absolute difference RPD = Relative Percent Difference

TSS results for greater than a quarter (38%) of the total groundwater field duplicate pair analyses did not meet evaluative criteria. Accordingly, qualification was extended to all TSS results in groundwater samples with an indeterminate bias direction, as it was uncertain which of the two results was more accurate. The remaining data qualifications on the basis of field duplicate disagreements were limited to the field duplicate pair due to the low frequency of occurrences. As all other field duplicate comparisons met the criteria as specified in the QAPP, no additional qualifications were considered necessary as a result of the overall assessment. Based on the FD results, the overall level of precision demonstrated is considered to be acceptable.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blank samples were prepared by pouring ASTM type II water/laboratory supplied “reagent-free” water over decontaminated sampling equipment and collecting the water in the appropriate sampling containers. Rinsate blanks are prepared in an identical manner to the samples with which they are associated. Table 5-3 summarizes the rinsate blank samples associated with the samples collected during the April Groundwater and Surface Water Sampling Event.

Dilution schemes were implemented for metals analyses on the basis of pH class. Data packages were accordingly designated as A, B, or C. As two rinsate blank samples (#3 and #4) were submitted with class A samples, they were analyzed at the dilutions associated with the analyses of class A metals. As such, metal results for the class A rinsate blanks were biased high, with non-detect results at elevated reporting limits. It was therefore determined necessary to review rinsate blank results within these two category types. Class A rinsate blank (#3, and #4) sample results were applicable to class A samples. Likewise, class C rinsate blank (#1,#2, and #s 5-9) sample results were applicable to class C samples.

Table 5-3
Summary of Rinsate Blank Samples Collected April 2004

Sample ID	Metals	Inorganics	Volatile Organics	Semivolatile Organics	Explosives	TPH
GROUNDWATER – TOTAL FRACTION						
RB01T/D-GRW (WAT283C)	X	X	X	---	X	---
RB02T/D-GRW (WAT283C)	X	X	X	X	---	X
RB03T/D-GRW (WAT291A)	X	X	---	---	---	---
RB04T/D-GRW (WAT289A)	X	X	---	---	---	---
RB05T/D-GRW (WAT293C)	X	X	---	---	---	---
RB06T/D-GRW (WAT280C)	X	X	---	---	---	---
RB07T/D-GRW (WAT276C)	X	X	---	---	---	---
RB08T/D-GRW (WAT274C)	X	X	---	---	---	---
RB09TD-GRW (WAT274C)	X	X	---	---	---	---
Frequency:	5.6	5.6	100	100	100	100
SURFACE WATER						
RB01T/D-SFW (WAT275S282S)	X	X	---	---	---	X
Frequency:	6.3	6.3	---	---	---	100

The QAPP required frequency of 5% for the collection of rinsate blanks was met for the April 2004 sampling event.

Table 5-4 summarizes the analytes detected in the associated RI/FS rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which qualification was considered.

Table 5-4
Summary of Rinsate Blank Results and Additional Qualifications

Analytes	# Detections (A/C)	Total # Samples (A/C)	% Detections (A/C)	Average Conc. (mg/L) (A/C)	x5 Criteria (mg/L) (A/C)	Range for Field Samples (mg/L)	Action
GROUNDWATER- TOTAL FRACTION							
Total Dissolved Solids (TDS)	9	9	100	7.34	36.7	102-24400	None
Total Suspended Solids (TSS)	4	9	44.4	1.48	7.44	0.5-1300	TSS results ≤7.44→ U RB-I
Chloride	7	9	77.8	0.42	2.09	0.82-301	Chloride results ≤ 2.09→ U RB-I
Bicarbonate Alkalinity (BALK)	9	9	100	2.88	14.4	1-496	BAlk results ≤ 14.4→ U RB-I
Total Alkalinity (TALK)	9	9	100	2.88	14.4	1-496	TAlk results ≤ 14.4→ U RB-I
Ammonia	6	9	66.7	0.06	0.28	0.004-2.3	Ammonia results ≤ 0.28 →U RB-I
Total Kieldahl Nitrogen (TKN)	2	9	22.2	4.92	24.6	0.24-2.1	TKN results ≤ 24.6 →U RB-I
Total Organic Carbon (TOC)	4	9	44.4	0.93	4.67	1-14.3	TOC results ≤ 4.67 →U RB-I
Chromium	2	7	28.6	0.64	3.2 (C)	0.6-606	Chromium results for pH class C samples ≤ 3.2→ U RB-I
Copper	2	7	28.6	0.80	4.0 (C)	0.7-9600	Copper results for pH class C samples ≤ 4.0 →U RB-I
Molybdenum	1	7	14.3	0.77	3.85 (C)	1.9-1390	Molybdenum results for pH class C samples ≤ 3.85→U RB-I
Sodium	1	2	50	17150	85,750 (A)	1730-134000	Sodium results for pH class A samples ≤ 87,750 →U RB-I
GROUNDWATER- DISSOLVED FRACTION							
Cobalt	2	7	28.6	1.08	5.39 (C)	1.1-4490	Cobalt results for pH class C samples ≤ 5.39 →U RB-I
Silver	1	7	14.3	0.21	1.06 (C)	0.2-1	Silver results for pH class C samples ≤ 1.06 →U RB-I
Sodium	2	7	28.6	5.72	175,750 (A)	1730-143000	Sodium results for pH class A samples ≤ 175,750 →U RB-I
SURFACE WATER- TOTAL FRACTION							
Chromium	1	2	50	0.83	4.15	0.8-2.6	Chromium results ≤4.15→ U RB-I
Total Dissolved Solids (TDS)	1	2	50	11	55	152-2140	None
Bicarbonate Alkalinity (BALK)	1	2	50	0.76	14.5	56.8-68.6	None
Total Alkalinity (TALK)	1	2	50	0.76	14.5	56.8-68.6	None
Ammonia	1	2	50	0.07	0.35	0.04-0.12	Ammonia results ≤ 0.35 →U RB-I
Total Organic Carbon (TOC)	1	2	50	2.3	11.5	2.9-4.2	TOC results ≤ 11.5 →U RB-I

(C) = pH class dilution scheme used for rinsate blank analysis

(A) = pH class dilution scheme used for rinsate blank analysis.

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results less than the calculated criteria concentration. In determining the average concentrations, for nondetect values, one half the RL was used to represent the contributing concentration, as opposed to zero, which could potentially bias the average concentration low. Despite the fact that some results were qualified as nondetect on the basis of rinsate blank detections, the rinsate blank results are generally indicative of acceptable decontamination procedures as detections were infrequent and at low levels.

5.3 FIELD BLANK RESULTS

The analyses of organic parameters require field blanks to assure appropriate quality control. The field blank results are utilized to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Table 5-7 summarizes the field blank samples that were collected with the organic samples in this data package. The required QC frequency of 5% was attained.

Table 5-5
Summary of Field Blank Samples Collected April 2004

Sample ID	Volatile Organics	Semivolatile Organics	Explosives	TPH
GROUNDWATER –TOTAL FRACTION				
FB01T-GRW (WAT283C)	X	---	X	---
FB02T-GRW (WAT284C)	X	X	---	X
Frequency:	100	100	100	100

No analytes were detected in either field blank sample, indicating that cross-contamination of field samples due to ambient field conditions was unlikely.

5.4 TRIP BLANK RESULTS

A trip blank accompanied each cooler of VOC samples to the sampling site, was handled like an environmental sample, and was returned to the laboratory for analysis. Trip blank results were used to assess the potential introduction of contaminants from sample containers or during the transportation/storage procedures. As all trip blank sample results associated with the organic samples in the April 2004 sampling event were nondetect, the possibility of contamination from the above mentioned sources was unlikely.

With the exception of two 2-Chloroethyl Vinyl Ether results, all data were considered acceptable for use in meeting project objectives as qualified. Multiple sample results were qualified as nondetect on the basis of laboratory blank or rinsate blank contamination. Others were qualified as estimated on the basis of matrix spike, LCS, or surrogate recoveries. Lastly, several data results were qualified as estimated on the basis of holding time exceedances, serial dilution results, laboratory/field duplicate disagreements, total versus partial disagreements, anion/cation imbalances, or calibration results (for organics). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment for April 2004

Analysis Type	QC Measure	# of Measurements	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	FD	152	146	96.1
	LD	171	170	99.4
Total Metals*	FD	208	208	100
	LD	234	234	100
Dissolved Metals	FD	200	200	100
	LD	225	225	100
Volatile Organics	FD	672	672	100
	MS/MSD	756	756	100
Semivolatile Organcis	FD	200	200	100
	MS/MSD	225	225	100
Explosives	FD	40	39	97.5
	MS/MSD	45	45	100
SURFACE WATER				
Inorganics	FD	19	19	100
	LD	19	19	100
Total Metal*	FD	26	26	100
	LD	26	26	100
Dissolved Metals	FD	25	25	100
	LD	25	25	100
BOD_5/COD	FD	2	2	100
	LD	2	2	100
TPH (DRO)	FD	2	2	100
	LD	2	2	100

*Total metals analyte counts include cyanide

The percentage of acceptable precision measurements ranged from 96.1% to 100% for all parameters. As such, the overall level of precision demonstrated for all analyses was considered to be acceptable.

6.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. These measurements were expressed as percent recoveries for matrix spike (MS), summarized in Table 6-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters.

Table 6-2
Summary of Accuracy Assessment for April 2004

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	MS	90	83	92.2
Metals	MS	365	347	95.1
Volatile Organics	MS/MSD	84	78	92.9
Semivolatile Organics	MS/MSD	25	25	100
Explosives	MS/MSD	5	5	100
SURFACE WATER				
Inorganics	MS	10	8	**80.0**
Metals	MS	44	44	100
BOD/COD	MS	2	2	100
TPH (DRO)	MS	1	1	100

The percentage of acceptable accuracy measurements ranged from 92-100%. The overall level of accuracy with respect to the site matrix demonstrated for all analyses collectively was considered to be acceptable.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results were considered usable as qualified for meeting project objectives, with the exception of the two 2-Chloroethyl Vinyl Ether results (samples MMW-48A-T01N-GRW and MMW-48A-T01D-GRW), which were rejected on the basis of extremely low matrix recoveries (0%). As such, the analytical completeness attained is 99.6%, which satisfies the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the groundwater and surface water samples collected during the April 2004 sampling event. The general close agreement between the field duplicate results, as discussed in Section 6.1, indicated that the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 6.2 indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analytes. Where possible, the laboratory submitted data from lesser dilutions (for organic analyses), thereby achieving detection limits for non-detects, as specified in the QAPP. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. While it is anticipated that all non-rejected data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT272C Sampling Event: April 2004 GRW/SFW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 05/17/04

Peer Reviewer: Stacey Coker Date Completed: 05/18/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
MW-4-T01N-GRW	SA	566966	W	X	X
MW-4-D01N-GRW	SA	566967	W	X	
US-3-T01N-GRW	SA	566968	W	X	X
US-3-D01N-GRW	SA	566969	W	X	
US-2-T01N-GRW	SA	566970	W	X	X
US-2-D01N-GRW	SA	566971	W	X	
EW-4-T01N-GRW	SA	566972	W	X	X
EW-4-D01N-GRW	SA	566973	W	X	
EW-5A-T01N-GRW	SA	567154	W	X	X
EW-5A-D01N-GRW	SA	567155	W	X	
EW-5A-T01D-GRW	FD	567156	W	X	X
EW-5A-D01D-GRW	FD	567157	W	X	
EW-5B-T01N-GRW	SA	567158	W	X	X
EW-5B-D01N-GRW	SA	567159	W	X	
MW-1-T01N-GRW	SA	567160	W	X	X
MW-1-D01N-GRW	SA	567161	W	X	
US-1-T01N-GRW	SA	567162	W	X	X
US-1-D01N-GRW	SA	567163	W	X	

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative noted that cation/anion balances were calculated for samples AWWT-2 and RB01T to check the correctness of the analyses as referenced in method SM 1030F. However, this statement was not relevant to this data package, as these samples were not presented in this data delivery

group. It is suspected that this statement on behalf of the laboratory was a carry-over from another data package. Cation/anion balance calculations were presented for all samples in this delivery group.

As noted in the laboratory case narrative, the associated calibration check standards for the TOC analyses of the samples in this delivery group exhibited percent recoveries that were slightly above control criteria (±10%), ranging from 114-118%. In addition, the analyses of the associated calibration blanks yielded concentrations slightly in excess of the reporting limit (1.0 mg/L). Upon review of the raw data, it was verified that continuing calibration blanks CCB1, CCB2, CCB3, CCB4, and CCB5 reported TOC detections in excess of the reporting limit (1.0 mg/L), ranging from 1.16 to 1.90 mg/L. TOC results for all samples were qualified as nondetect on the basis of CCB results.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, samples EW-5B-T01N-GRW and MW-1-T01N-GRW for cyanide analysis were received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect results for these samples were qualified as estimated (UJ), with an indeterminate bias direction.
Holding Times	No	All sample results for nitrate were qualified as estimated (J/UJ). Samples were analyzed in excess of 48 hours, but less than 2x the prescribed analytical holding time. Accordingly, it was not necessary to consider rejecting nondetect results. Nitrite and orthophosphate results for sample US-1-T01N-GRW were qualified as estimated (UJ), as the 48 hour holding time had been exceeded. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken seven to eight days after sampling and five to six days beyond log-in. The pH for the same samples were measured approximately four hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
• Matrix QC MS/MSD MW-1-T01N-GRWMS MW-1-D01N-GRWMS (metals only) US-1-T01N-GRWMS US-1-D01N-GRWMS (metals only) • PDS MW-1-T01N-GRWA MW-1-D01N-GRWA US-1-T01N-GRWA US-1-D01N-GRWA • LD MW-1-T01N-GRWD MW-1-D01N-GRWD US-1-T01N-GRWD US-1-D01N-GRWD	No	Ammonia-nitrogen was recovered slightly below the acceptance range of 75-125% for matrix spike sample US-1-T01N-GRW. As such, the ammonia-nitrogen result for this sample was qualified as estimated (J) with a low bias direction assigned. All other matrix spike recoveries were acceptable for both inorganics and metals. Despite the fact that the laboratory duplicate summary forms reported RPDs in excess of the evaluation criterion for several analytes, no qualification of data was necessary when the CRDL was used in place of the IDL, adjusted for dilution, for the concentration-dependent comparison calculations. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
• Method QC • Surrogates • Serial Dilution (C) MW-1-T01N-GRWSL (18) MW-1-D01N-GRWSL (18) US-1-T01N-GRWSL (15) US-1-D01N-GRWSL (16) • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses run on the four samples to the left were applicable for the majority of analytes. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The numbers in the parentheses to the right of the samples in the list correspond with the number of applicable analytes for each sample. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. As specified in the QAPP, %Ds > 10% would result in qualification of analyte results as estimated (J/UJ). The reported percent difference for zinc in sample US-1-D01N-GRW was 10.8%. As the diluted result is generally considered the more accurate of the two, comparison of the initial sample result with the diluted result indicates a potential bias direction. As a comparison of the initial and dilute results indicated a potential high bias and zinc was nondetect in this sample, no qualification was necessary. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5, with the exception of US-3-*01N-GRW. The TDS ratio reported for this sample was 1.56, indicating that the calculated TDS value relative to the TDS measured value was elevated. The cation/anion balance was independently calculated and was consistent with the 0.88% difference as reported by the lab. The independently calculated TDS value was 152 mg/L vs. the laboratory's reported TDS calculated value of 160 mg/L. This resulted in a TDS ratio of 1.49. It was therefore considered unnecessary to qualify any results on the basis of total vs. partial disagreement.
• Field QC • Field Duplicate MW-1-T01N/T01D-GRW MW-1-D01N/D01D-GRW US-1-T01N/T01D-GRW US-1-D01N/D01D-GRW • Rinsate Blank • Field Blank • Trip Blank	Yes	Field duplicate samples were assessed for overall precision of the analyses. As all field duplicate pairs met the criteria set forth in the QAPP, no qualification of data was necessary on the basis of field duplicate disagreement. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	PH (std units)
MW-4-T01N-GRW	0.47 J	---	---	231 J	7.6 J
US-3-T01N-GRW	0.27 J	---	---	176 J	7.2 J
US-2-T01N-GRW	0.46 J	---	---	349 J	6.5 J
EW-4-T01N-GRW	0.32 J	---	---	1140 J	7.2 J
EW-5A-T01N-GRW	0.20 UJ	---	---	1670 J	7.2 J
EW-5A-T01D-GRW	0.20 UJ	---	---	1600 J	7.3 J
EW-5B-T01N-GRW	0.20 UJ	---	---	1460 J	7.4 J
MW-1-T01N-GRW	0.53 J	---	---	1490 J	7.4 J
US-1-T01N-GRW	0.30 J	0.0050 UJ	0.010 UJ	179 J	7.7 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	32.6	---	19.8	17.7	24.8	---	17.6	US-2-D01N-GRW US-2-T01N-GRW	U CCB-I
Beryllium (P)	---	0.6	---	---	0.4	-0.601	0.3	All samples qualified	UJ MB-L UJ MB,CCB-I
Chromium (P)	---	---	1.3	2.5	3.4	0.832	0.6	All sample results with the *exception* of: MW-1-D01N-GRW US-1-D01N-GRW US-2-T01N-GRW	U MB,CCB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Copper (P)	---	---	2.8	3.0	3.1	2.757	1.4	EW-4-D01N-GRW EW-4-T01N-GRW EW-5A-T01D-GRW EW-5A-T01N-GRW EW-5B-D01N-GRW EW-5B-T01N-GRW US-2-D01N-GRW	U MB,CCB-I
Nickel (P)	---	---	2.8	2.8	2.8	-1.581	1.5	All sample results with the *exception* of: US-2-D01N-GRW US-2-T01N-GRW US-3-D01N-GRW	UJ MB-L UJ MB,CCB-L
Zinc (P)	-2.4	-2.4	-.24	-2.5	-2.4	-1.565	1.5	All sample results with the *exception* of: US-2-D01N-GRW US-2-T01N-GRW	UJ MB,CCB-L

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT273A Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 05/17/04

Peer Reviewer: Stacey Coker Date Completed: 05/18/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
LOWERSPRING13-T101N-GRW	SA	567095	LOWERSPG13-T01N-GRW LOWERSPG13-T01N-GR	W	X	X
LOWERSPRING13-D01N-GRW	SA	567096	LOWERSPG13-D01N-GRW LOWERSPG13-D01N-GR	W	X	
GWW2-T01N-GRW	SA	567097		W	X	X
GWW2-D01N-GRW	SA	567098		W	X	
GWW1-T01N-GRW	SA	567099		W	X	X
GWW1-D01N-GRW	SA	567100		W	X	
SPRING13-T01N-GRW	SA	567101		W	X	X
SPRING13-D01N-GRW	SA	567102		W	X	
MMW-29A-T01N-GRW	SA	567103		W	X	X
MMW-29A-D01N-GRW	SA	567104		W	X	
MMW-33A-T01N-GRW	SA	567105		W	X	X
MMW-33A-D01N-GRW	SA	567106		W	X	
GWW-3-T01N-GRW	SA	567107		W	X	X
GWW-3-D01N-GRW	SA	567108		W	X	
MMW-49A-T01N-GRW	SA	567109		W	X	X
MMW-49A-D01N-GRW	SA	567110		W	X	
MMW-50A-T01N-GRW	SA	567111		W	X	X
MMW-50A-D01N-GRW	SA	567112		W	X	
SPRING13PUMP-T01N-GRW	SA	567113	SPRING13PUMP-T01N-GR	W	X	X
SPRING13PUMP-D01N-GRW	SA	567114	SPRING13PUMP-D01N-G	W	X	
SPRING39PUMP-T01N-GRW	SA	567115	SPRING39PUMP-T01N-GR	W	X	X
SPRING39PUMP-D01N-GRW	SA	567116	SPRING39PUMP-D01N-G	W	X	

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative notes that during the chloride analysis from 04/26/04, the initial and continuing calibration blanks yielded concentrations that were slightly above the reporting limit (0.20 mg/L). The laboratory reported chloride results greater than 10x the blank concentrations from this sequence. The remaining samples were reanalyzed yielding acceptable results. This did not affect the quality or usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory log-in sheet noted that the COC on which sample GWW1-D01N-GRW was listed requested an inorganics suite analysis. However, as this dissolved fraction sample was intended for metals analysis only, it was logged in and analyzed accordingly.
Holding Times	No	The majority of sample results for nitrate, nitrite, and orthophoshpate were qualified as estimated (J/UJ). Samples were analyzed in excess of 48 hours, but less than 2x the prescribed analytical holding time. Accordingly, it was not necessary to consider rejecting nondetect results. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken seven days after sampling and five days beyond log-in. The pH for the same samples were measured approximately four hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Chloride was detected in the method blank run on 04/26/04 at a concentration of 0.28 mg/L. Due to the fact that all sample result for chloride were in excess of 5x the blank detection, no qualification of data was necessary. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD GWW-3-T01N-GRWMS GWW-3-D01N-GRWMS PDS GWW-3-T01N-GRWA GWW-3-D01N-GRWA LD GWW-3-T01N-GRWD GWW-3-D01N-GRWD	No	Ammonia-nitrogen, Total Organic Carbon (TOC), and several metal analytes were recovered outside the acceptance range of 75-125% for matrix spike analyses. Table 1.3 summarizes these analytes, along with their recoveries and resultant data qualifications assigned. Despite the fact that the laboratory duplicate summary forms reported RPDs in excess of the evaluation criterion for several analytes, no qualification of data was necessary when the CRDL was used in place of the IDL, adjusted for dilution, for the concentration-dependent comparison calculations. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC Surrogates Serial Dilution (A) GWW-3-T01N-GRWSL GWW-3-D01N-GRWSL Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analyses run on the matrix spikes of samples GWW-3-T01N-GRW and GWW-3-D01N-GRW were applicable for only three of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. As the %Ds for the applicable analytes ranged between 0.6 and 5.1%Ds , no qualification of data results was necessary.. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances
Field QC Field Duplicate Rinsate Blank Field Blank Trip Blank		This SDG did not include the analysis of Field QC samples. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	PH (std units)
LOWERSPRING13-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	1810 J	3.9 J
GWW2-T01N-GRW	2.6 J	0.0050 UJ	0.023 J	1620 J	4.7 J
GWW1-T01N-GRW	3.6 J	0.023 J	0.026 J	1450 J	5.0 J
SPRING13-T01N-GRW	0.21 J	0.0069 J	0.014 J	1930 J	4.1 J
MMW-29A-T01N-GRW	3.4 J	0.0050 UJ	0.0022 J	1410 J	5.1 J
MMW-33A-T01N-GRW	2.2 J	0.0050 UJ	0.018 J	1350 J	4.9 J
GWW-3-T01N-GRW	2.4 J	0.0050 UJ	0.024 J	1420 J	4.9 J
MMW-49A-T01N-GRW	2.4 J	---	---	1420 J	4.8 J
MMW-50A-T01N-GRW	0.40 J	0.0050 UJ	0.010 UJ	1220 J	4.5 J
SPRING13PUMP-T01N-GRW	0.25 J	0.011 J	0.010 UJ	1420 J	4.1 J
SPRING39PUMP-T01N-GRW	1.6 J	0.0050 UJ	0.010 UJ	1310 J	5.1 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Arsenic (P)	---	---	---	-5.5	---	---	3.7	MMW-49A-D01N-GRW MMW-49A-T01N-GRW MMW-50A-D01N-GRW MMW-50A-T01N-GRW SPRING13PUMP-T01N-GRW SPRING13-T01N-GRW	UJ CCB-L
Beryllium (P)	---	---	0.4	0.4	---	---	0.3	GWW-3-D01N-GRW GWW-3-T01N-GRW MMW-29A-D01N-GRW MMW-29A-T01N-GRW MMW-33A-D01N-GRW MMW-33A-T01N-GRW MMW-49A-D01N-GRW MMW-49A-T01N-GRW MMW-50A-D01N-GRW MMW-50A-T01N-GRW SPRING13PUMP-T01N-GRW SPRING39-PUMP-D01N-GRW SPRING39-PUMP-T01N-GRW	U CCB-I
Boron (P)	2.4	2.0	---	---	---	2.05	1.8	SPRING39PUMP-D01N-GRW	U MB,CCB-I
Chromium (P)	-1.3	---	---	---	---	-1.99	1.3	SPRING39PUMP-D01N-GRW SPRING39PUMP-T01N-GRW	UJ MB,CCB-L
Copper (P)	---	3.4	---	---	---	---	2.7	SPRING39PUMP-T01N-GRW	U CCB-I
Mercury (CV)	-0.1	---	---	---	-0.1	---	0.1	GWW1-D01N-GRW GWW1-T01N-GRW GWW2-D01N-GRW GWW2-T01N-GRW SPRING13-T01N-GRW SPRING39PUMP-D01N-GRW SPRING39PUMP-T01N-GRW	UJ CCB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Molybdenum (P)	2.1	---	---	---	---	32.26	1.4	GWW1-D01N-GRW SPRING39PUMP-D01N-GRW SPRING39PUMP-T01N-GRW	U MB,CCB-I
Silver (MS)	-0.1	-0.1	-0.1	-0.1	-0.1	-1.47	0.10	All samples were qualified	UJ MB,CCB-L
Sodium (P)	-419.7	680.7	---	---	---	2116.8/ -337.7	327.5	All samples were qualified.	UJ MB-L J MB-L UJ MB,CCB-L

CV = Cold Vapor MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Parent Sample Qualification
GWW-3-T01N-GRWMS				
Ammonia-Nitrogen	69	N/A	75-125	J MS-L
Total Organic Carbon	127			J MS-H
Arsenic	67.8	94.9		UJ MS-L
Cobalt	126.9	103.4		ND (NQ)
Selenium	134.6	113.7		ND (NQ)
Cyanide	63.5	N/A	85-115	UJ MS-L
GWW-3-D01N-GRWMS				
Cyanide	59.5	N/A	85-115	UJ MS-L
Selenium	139.0	108.8	75-125	ND (NQ)

N/A = Not appropriate ND (NQ) = No Qualification due to nondetect result with high bias.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT274C Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 05/25/04

Peer Reviewer: Stacey Coker Date Completed: 06/01/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
MMW-28A-T01N-GRW	SA	567188	W	X	X
MMW-28A-D01N-GRW	SA	567189	W	X	
EW-1-T01N-GRW	SA	567190	W	X	X
EW-1-D01N-GRW	SA	567191	W	X	
MW-9A-T01N-GRW	SA	567192	W	X	X
MW-9A-D01N-GRW	SA	567193	W	X	
SUMP5000-T01N-GRW	SA	567194	W	X	X
SUMP5000-D01N-GRW	SA	567195	W	X	
RB09T-GRW	RB	567196	W	X	X
RB09D-GRW	RB	567197	W	X	
RB08T-GRW	RB	567198	W	X	X
RB08D-GRW	RB	567199	W	X	

Matrix: W = Water QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative noted that cation/anion balances were calculated for samples AWWT-2 and RB01T to check the correctness of the analyses as referenced in method SM 1030F. However, this statement was not relevant to this data package, as these samples were not presented in this data delivery group. It is suspected that this statement on behalf of the laboratory was a carry-over from another data package. Cation/anion balance calculations were presented and within evaluation criteria for all samples in this delivery group.

The laboratory case narrative notes that during the chloride analysis from 04/26/04, the initial and continuing calibration blanks yielded concentrations that were slightly above the reporting limit (0.20 mg/L). The laboratory reported chloride results greater than 10x the blank concentrations from this

sequence. The remaining samples were reanalyzed yielding acceptable results. This did not affect the quality or usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The majority of sample results for nitrate, nitrite, and orthophoshpate were qualified as estimated (J/UJ). Samples were analyzed in excess of 48 hours, but less than 2x the prescribed analytical holding time. Accordingly, it was not necessary to consider rejecting nondetect results. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken seven days after sampling and five days beyond log-in. The pH for the same samples were measured approximately four hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Chloride was detected in the method blank run on 04/26/04 at a concentration of 0.31 mg/L. All sample results for chloride were in excess of 5x the blank detection, with the exception of RB08T-GRW and RB09T-GRW. Accordingly, the chloride results for these two samples were qualified as nondetect. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD PDS LD	No	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (C) MMW-28A-T01N-GRWL Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analysis run on sample MMW-28A-T01N-GRW was applicable for only one (calcium) of the 24 analytes. All other analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent difference (between initial and serial dilution results) was reviewed for an excess of 10%. As the %D for calcium was 0.3%, no qualification of data results was necessary. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the u stability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5, with the exception of rinsate blank samples RB09*-GRW and RB08*-GRW, which reported TDS ratios of 3.17 and 4.34, respectively. Both elevated TDS ratios indicated the TDS calculated concentrations were high relative to the measured TDS concentrations. The concentrations in these samples were low enough that the reporting limits controlled the calculations. The TDS ratios were therefore not an appropriate measure of accuracy for these two samples. No qualification was considered necessary. Sample SUMP5000-T01N-GRW reported an elevated recovery for the internal standard ^{89}Y. The analytes associated with this internal standard, beryllium and molybdenum, were reported from the trace ICP. The trace

Review Parameter	Criteria Met?	Comments
		ICP reporting limits for the afore mentioned analytes met the requirements of the QAPP such that the change in instrumentation did not affect the usability of the data. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC Field Duplicate Rinsate Blank RB08D/T-GRW RB09D/T-GRW	Yes	The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
MMW-28A-T01N-GRW	0.59 J	0.0050 UJ	0.010 UJ	752 J	6.8 J
EW-1-T01N-GRW	0.74 J	0.0050 UJ	0.13 J	611 J	7.6 J
MW-9A-T01N-GRW	0.57 J	---	0.016 J	1240 J	7.5 J
SUMP5000-T01N-GRW	2.7 J	0.0050 UJ	0.010 UJ	1600 J	7.7 J
RB09T-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	0.64 J	8.1 J
RB08T-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	0.00 J	7.9 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Cadmium (P)	---	0.3	0.3	0.3	---	---	0.3	MMW-28A-D01N-GRW MMW-28A-T01N-GRW	U CCB-I
Chloride	---	---	---	---	---	0.31 (mg/L)	0.20 (mg/L)	RB08T-GRW RB09T-GRW	U MB-I
Iron (P)	---	19.4	25.4	22.2	---	20.8	19.2	EW-1-T01N-GRW SUMP5000-T01N-GRW	U MB,CCB-I
Mercury (CV)	-0.1	---	---	---	-0.1	---	0.1	EW-1-D01N-GRW EW-1-T01N-GRW MMW-28A-D01N-GRW MMW-28A-T01N-GRW MW-9A-T01N-GRW	UJ CCB-L
Zinc (P)	---	---	---	---	---	2.018	1.5	EW-1-D01N-GRW EW-1-T01N-GRW	U MB-I

CV = Cold Vapor P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT275S Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 05/25/04

Peer Reviewer: Stacey Coker Date Completed: 06/01/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
RRDS-SPRING13-T01N-SFW	SA	567217	RRDS-SPRNG13-T01N-SFW RRDS-SPRNG13-T01N-SF	W	X	X
RRDS-SPRING13-D01N-SFW	SA	567218	RRDS-SPRNG13-D01N-SFW RRDS-SPRNG13-D01N-SF	W	X	
RRDS-SPRING13-T01D-SFW	FD	567219	RRDS-SPRNG13-T01D-SFW RRDS-SPRNG13-T01D-SF	W	X	X
RRDS-SPRING13-D01D-SFW	FD	567220	RRDS-SPRNG13-D01D-SFW RRDS-SPRNG13-D01D-SF	W	X	
RRDS-SPRING39-T01N-SFW	SA	567221	RRDS-SPRNG39-T01N-SFW RRDS-SPRNG39-T01N-SF	W	X	X
RRDS-SPRING39-D01N-SFW	SA	567222	RRDS-SPRNG39-D01N-SFW RRDS-SPRNG39-D01N-SF	W	X	
RRUS-SPRING39-T01N-SFW	SA	567223	RRUS-SPRNG39-T01N-SFW RRUS-SPRNG39-T01N-SF	W	X	X
RRUS-SPRING39-D01N-SFW	SA	567224	RRUS-SPRNG39-D01N-SFW RRUS-SPRNG39-D01N-SF	W	X	
RRUS-SPRING13-T01N-SFW	SA	567225	RRUS-SPRNG13-T01N-SFW RRUS-SPRNG13-T01N-SF	W	X	X
RRUS-SPRING13-D01N-SFW	SA	567226	RRUS-SPRNG13-D01N-SFW RRUS-SPRNG13-D01N-SF	W	X	
RB01T-SFW	RB	567227		W	X	X
RB01D-SFW	RB	567228		W		

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative notes that during the chloride analysis from 04/26/04, the initial and continuing calibration blanks yielded concentrations that were slightly above the reporting limit (0.20 mg/L). The laboratory reported chloride results greater than 10x the blank concentrations from this sequence. The remaining samples were reanalyzed yielding acceptable results. This did not affect the quality or usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory log-in sheet noted that samples RR-US-SPRING13-T01N-SFW and RR-US-SPRING13-D01N-SFW were recorded on the COC with sampling times of 0922 and 1108. However, the container labels on these samples indicated a sampling time of 1100. The collection time of 1100 was logged in for these two samples.
Holding Times	No	The majority of sample results for nitrate, nitrite, and orthophoshpate were qualified as estimated (J/UJ). Samples were analyzed in excess of 48 hours, but less than 2x the prescribed analytical holding time. Accordingly, it was not necessary to consider rejecting nondetect results. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 7 days after sampling and five days beyond log-in. The pH for the same samples were measured approximately four hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Chloride was detected in the method blank run on 04/26/04 at a concentration of 0.31 mg/L. All sample results for chloride were in excess of 5x the blank detection, with the exception of RB01T-SFW. Accordingly, the chloride result for sample RB01T-SFW was qualified as nondetect. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD RRUS-SPRING13-T01N-SFWMS RRUS-SPRING13-D01N-SFWMS PDS RRUS-SPRING13-T01N-SFWA RRUS-SPRING13-D01N-SFWA LD RRUS-SPRING13-T01N-SFWD RRUS-SPRING13-D01N-SFWD	No	The matrix spike recoveries for ammonia-nitrogen and Total Organic Carbon (TOC) for matrix spike sample RRUS-SPRING13-T01N-SFW were recovered outside the acceptance range of 75-125%. Table 1.3 summarizes these analytes, along with the recoveries and resultant data qualifications assigned. All matrix spike recoveries for metal analytes were recovered within the prescribed acceptance range. As such, none of results for metal analytes in either of the two parent samples were qualified on the basis of matrix spike recoveries. Despite the fact that the laboratory duplicate summary forms reported RPDs in excess of the evaluation criterion for several analytes, no qualification of data was necessary when the CRDL was used in place of the IDL, adjusted for dilution, for the concentration-dependent comparison calculations. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Method QC Surrogates Serial Dilution (C) RRUS-SPRING13-T01N-SFWSL RRUS-SPRING13-D01N-SFWSL Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analyses run on the matrix spikes of samples RRUS-SPRING13-T01N-SFW and RRUS-SPRING13-D01N-SFW were applicable for 20 of the 24 analytes. Four of the analytes for each sample were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. As the none of the %Ds for the applicable analytes were greater than 10%, no qualification of data results was necessary. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the u stability of data. All reported cation/anion balances met this criterion, with the exception of rinsate blank sample RB01*-SFW, which reported a –75.26% balance. As the concentrations were low enough that the reporting limits controlled the calculations, the cation/anion % difference was not representative of this comparison and therefore did not result in data qualification. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5, with the exception of rinsate blank sample RB01*-SFW, which reported a TDS ratio of 1.62. The elevated TDS ratio indicated that the TDS calculated concentration was high relative to the measured TDS concentration. The concentrations in this sample were low enough that the reporting limits controlled the calculations. The TDS ratio for this sample was therefore not an appropriate measure of accuracy. No qualification was considered necessary.
Field QC Field Duplicate RRDS-SPRING13-T01D-SFW RRDS-SPRING13-D01D-SFW Rinsate Blank RB01T-SFW RB01D-SFW	Yes	Field duplicate samples were assessed for overall precision of the analyses. As both field duplicate pairs met the criteria set forth in the QAPP, no qualification of data was necessary on the basis of field duplicate disagreement. Several inorganic and metal analytes were recovered in both total and dissolved fraction rinsate blanks. These detections will be assessed collectively with all other rinsate blank results to determine the need for qualification. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	

Review Parameter	Criteria Met?	Comments
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
RRDS-SPRING13-T01N-SFW	0.38 J	0.0050 UJ	0.010 UJ	272 J	7.2 J
RRDS-SPRING13-T01D-SFW	0.39 J	0.0050 UJ	0.010 UJ	278 J	7.5 J
RRDS-SPRING39-T01N-SFW	0.38 J	0.0050 UJ	0.010 UJ	262 J	7.6 J
RRUS-SPRING39-T01N-SFW	0.35 J	0.0050 UJ	0.010 UJ	246 J	7.7 J
RRUS-SPRING13-T01N-SFW	0.38 J	0.0050 UJ	0.010 UJ	271 J	7.7 J
RB01T-SFW	0.20 UJ	---	0.010 UJ	0.00 J	7.5 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	42.4	32.9	25.3	42.1	---	---	17.6	RRDS-SPRING13-D01D-SFW RRDS-SPRING13-D01N-SFW RRDS-SPRING39-D01N-SFW RRUS-SPRING39-D01N-SFW	U CCB-I
Antimony (MS)	-0.4	-0.4	---	-0.4	---	-0.468	0.40	All sample results were qualified	UJ MB,CCB-L
Boron (P)	2.4	1.9	---	2.1	---	2.028	1.8	RRDS-SPRING13-D01D-SFW RRDS-SPRING13-D01N-SFW RRDS-SPRING13-T01D-SFW RRDS-SPRING13-T01N-SFW RRDS-SPRING39-D01N-SFW RRDS-SPRING39-T01N-SFW RRUS-SPRING13-D01N-SFW RRUS-SPRING13-T01N-SFW RRUS-SPRING39-D01N-SFW RRUS-SPRING39-T01N-SFW	U MB,CCB-I
Copper (MS)	-1.3	-1.3	-1.3	-1.3	---	-1.181	0.80	RB01D-SFW RB01T-SFW RRDS-SPRING13-D01D-SFW RRDS-SPRING13-D01N-SFW RRDS-SPRING39-D01N-SFW RRUS-SPRING13-D01N-SFW RRUS-SPRING39-D01N-SFW	UJ MB,CCB-L J CCB-L J MB,CCB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Molybdenum (P)	0.8	0.7	0.7	0.7	---	0.764	0.30	All sample results were qualified	U MB, CCB-I
Sodium (P)	-307.7	---	-354.5	---	---	---	172.6	RB01D-SFW RB01T-SFW	UJ CCB-L

CV = Cold Vapor MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Parent Sample Qualification
RRUS-SPRING13-T01N-SFW				
Ammonia-Nitrogen	73	N/A	75-125%	U MS-L
Total Organic Carbon	180			J MS-H

N/A = Not appropriate

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT276C Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 05/25/04

Peer Reviewer: Stacey Coker Date Completed: 06/01/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
MW-21-T01N-GRW	SA	567260	W	X	X
MW-21-D01N-GRW	SA	567261	W	X	
MW-14-T01N-GRW	SA	567262	W	X	X
MW-14-D01N-GRW	SA	567263	W	X	
MW-14-T01D-GRW	FD	567264	W	X	X
MW-14-D01D-GRW	FD	567265	W	X	
MW-B-T01N-GRW	SA	567266	W	X	X
MW-B-D01N-GRW	SA	567267	W	X	
EW-5C-T01N-GRW	SA	567268	W	X	X
EW-5C-D01N-GRW	SA	567269	W	X	
RB07T-GRW	RB	567270	W	X	X
RB07D-GRW	RB	567271	W	X	
EW-2-T01N-GRW	SA	567272	W	X	X
EW-2-D01N-GRW	SA	567273	W	X	
EW-3-T01N-GRW	SA	567274	W	X	X
EW-3-D01N-GRW	SA	567275	W	X	
MW-20-T01N-GRW	SA	567276	W	X	X
MW-20-D01N-GRW	SA	567277	W	X	

Matrix: W = Water QC Type: SA = Sample

FD = Field Duplicate RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative noted that during the original nitrate analyses of the samples in this delivery group, the associated calibration check standards exhibited marginally elevated percent recoveries. Samples which did not detect nitrate above the reporting limit were reported from this sequence, whereas

the remaining samples were reanalyzed three days beyond the prescribed analytical holding time of 48 hours, yielding acceptable results. Any samples analyzed outside of holding time were qualified as estimated and are summarized in Table 1.1.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	As noted on the laboratory log-in sheet, and verified by the sample preservation document, sample MW-B-T01N-GRW, for the analysis of cyanide, was received at a reduced pH and required the addition of NaOH. Accordingly, the nondetect cyanide result for this sample was qualified as estimated (UJ) with a qualifier code of "P" and indeterminate bias direction assigned.
Holding Times	No	Several of the sample results for nitrite and orthophosphate were qualified as estimated (J/UJ), as the samples were analyzed in excess of 48 hours, but less than 2x the prescribed analytical holding time. The majority of the nitrate results were qualified as estimated (J). Many of these sample results were analyzed in excess of 2x the prescribed analytical holding time of 48 hours, but due to the fact that all of these results were detected, none of the results were considered for rejection. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken seven days after sampling and five days beyond log-in. The pH for the same samples were measured approximately seven ours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD PDS LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (C) MW-21-T01N-GRWL Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analysis run on sample MW-21-T01N-GRW was applicable for only two of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. As the %Ds for the applicable analytes ranged between 2.3 and 3.1%Ds , no qualification of data results was necessary. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. Nickel results for samples EW-3-T01N-GRW and EW-3-D01N-GRW were qualified as estimated (UJ) as the criterion for Total vs Partial agreement was not met. Likewise, zinc results for samples MW-20-T01N-GRW and MW-20-D01N-GRW were qualified as estimated (J/UJ). The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5, with the exception of rinsate blank sample RB07*-GRW, which reported a TDS ratio of 3.55. The elevated TDS ratio indicated the TDS calculated concentration was high relative to the measured TDS concentration. The concentrations in this sample were low enough that the reporting limits controlled the calculations. The TDS ratio for this sample was therefore not an appropriate measure of accuracy. No qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC Field Duplicate MW-14-T01D-GRW MW-14-D01D-GRW Rinsate Blank RB07T-GRW RB07D-GRW	Yes	Field duplicate samples were assessed for overall precision of the analyses. As both field duplicate pairs met the criteria set forth in the QAPP, no qualification of data was necessary on the basis of field duplicate disagreement. Several inorganic and metal analytes were recovered in both total and dissolved fraction rinsate blanks. These detections will be assessed collectively with all other rinsate blank results to determine the need for qualification. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. Comparison of the LCS and the LCSD for TOC resulted in a RPD of 23%, in excess of the 20% criterion limit. Accordingly, all TOC results were qualified as estimated (J) with a qualifier code of "D" and indeterminate bias direction assigned. As the remaining LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
MW-21-T01N-GRW	---	---	---	1010 J	7.7 J
MW-14-T01N-GRW	0.67 J	---	0.018 J	852 J	7.5 J
MW-14-T01D-GRW	0.63 J	---	0.017 J	855 J	7.4 J
MW-B-T01N-GRW	0.26 J	0.0064 J	0.010 UJ	1440 J	7.4 J
EW-5C-T01N-GRW	0.29 J	---	---	1510 J	7.3 J
RB07T-GRW	---	---	---	0.00 J	7.3 J
EW-2-T01N-GRW	0.64 J	---	---	461 J	8.1 J
EW-3-T01N-GRW	0.46 J	---	---	1350 J	7.3 J
MW-20-T01N-GRW	2.1 J	---	---	392 J	7.7 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	48.7	25.7	---	---	---	45.95	17.6	MW-14-D01D-GRW MW-14-D01N-GRW MW-14-T01D-GRW MW-14-T01N-GRW MW-21-D01N-GRW MW-21-T01N-GRW	U MB,CCB-I
Antimony (MS)	-0.4	-0.4	---	-0.4	-0.4	-1.062	0.40	All sample results were qualified	UJ MB,CCB-L
Beryllium (P)	0.2	0.3	0.2	0.2	---	---	0.20	MW-14-D01D-GRW MW-20-D01N-GRW MW-20-T01N-GRW RB07T-GRW	U CCB-I
Chromium (P)	---	---	0.9	---	---	---	0.80	EW-2-D01N-GRW EW-2-T01N-GRW EW-3-D01N-GRW EW-3-T01N-GRW EW-5C-D01N-GRW EW-5C-T01N-GRW MW-20-D01N-GRW MW-20-T01N-GRW MW-B-D01N-GRW MW-B-T01N-GRW RB07D-GRW	U CCB-I
Cobalt (P)	---	1.1	1.2	---	---	---	1.1	EW-2-D01N-GRW EW-3-D01N-GRW EW-5C-D01N-GRW MW-20-D01N-GRW MW-21-D01N-GRW MW-B-D01N-GRW	U CCB-I
Copper (P)	---	---	0.8	-1.0	---	---	0.70	EW-3-D01N-GRW EW-5C-D01N-GRW MW-20-D01N-GRW MW-20-T01N-GRW MW-B-T01N-GRW RB07D-GRW	U CCB-I UJ CCB-L
Iron (P)	35.9	---	40.3	60.9	---	23.91	19.2	EW-2-D01N-GRW EW-2-T01N-GRW EW-3-D01N-GRW EW-3-T01N-GRW MW-20-D01N-GRW MW-21-T01N-GRW	U MB,CCB-I
Molybdenum (P)	---	---	---	1.5	---	---	1.0	MW-20-D01N-GRW MW-20-T01N-GRW	U CCB-I
Potassium (P)	-257.5	-179.0	---	---	---	-142.0	109.3	RB07D-GRW RB07T-GRW	UJ MB,CCB-L

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT277C Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 05/26/04

Peer Reviewer: Stacey Coker Date Completed: 06/01/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
MW-20-T01N-GRW	SA	567331		W	X	X
MW-20-D01N-GRW	SA	567332		W	X	
MW-A-T01N-GRW	SA	567333		W	X	X
MW-A-D01N-GRW	SA	567334		W	X	
MW-12-T01N-GRW	SA	567335		W	X	X
MW-12-D01N-GRW	SA	567336		W	X	
LS1-T01N-GRW	SA	567337		W	X	X
LS1-D01N-GRW	SA	567338		W	X	
LS2-T01N-GRW	SA	567339		W	X	X
LS2-D01N-GRW	SA	567340		W	X	
LS3-T01N-GRW	SA	567341		W	X	X
LS3-D01N-GRW	SA	567342		W	X	
MW-15-T01N-GRW	SA	567343		W	X	X
MW-15-D01N-GRW	SA	567344		W	X	
MW-12-T01D-GRW	FD	567345		W	X	X
MW-12-D01D-GRW	FD	567346		W	X	
OUTFALL002PIPE-T01N-GRW	SA	567347	OUTFALL2PIPE-T01N-GRW OUTFALL2PIPE-T01N-GR	W	X	X
OUTFALL002PIPE-D01N-GRW	SA	567348	OUTFALL2PIPED01N-GRW OUTFALL2PIPED01N-GR	W	X	
EW-5D-T01N-GRW	SA	567349		W	X	X
EW-5D-D01N-GRW	SA	567350		W	X	

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the Laboratory Form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative noted that during the original nitrate analyses of the samples in this delivery group, the associated calibration check standards exhibited marginally elevated percent recoveries. The laboratory case narrative noted that samples which did not detect nitrate above the reporting limit were reported from this sequence, whereas the remaining samples were reanalyzed three days beyond the prescribed analytical holding time of 48 hours, yielding acceptable results. As all nitrate analyses were reanalyzed outside of holding time, all results (with the exception of one that was rejected) were qualified as estimated as (J), as summarized in Table 1.1

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	As noted on the laboratory log-in sheet, and verified by the sample preservation document, sample MW-12-T01N-GRW, for the analysis of cyanide, was received at a reduced pH and required the addition of NaOH. Accordingly, the nondetect cyanide result for this sample was qualified as estimated (UJ) with a qualifier code of "P" and indeterminate bias direction assigned.
Holding Times	No	Several of the sample results for nitrite and orthophosphate were qualified as estimated (J/UJ), as the samples were analyzed in excess of 48 hours, but less than 2x the prescribed analytical holding time. All nitrate results were qualified as estimated (J), with the exception of MW-A-T01N-GRW, which was rejected (R). Nitrate for all samples was analyzed in excess of 2x the prescribed analytical holding time of 48 hours. All nitrate results were detected, with the exception of the above noted sample, which was rejected on the basis of a nondetect result for an analysis in "gross" exceedance (> 2x) of holding time. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken seven days after sampling and five days beyond log-in. The pH for the same samples were measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD EW-5D-T01N-GRWMS EW-5D-D01N-GRWMS PDS EW-5D-T01N-GRWA EW-5D-D01N-GRWA LD EW-5D-T01N-GRWD EW-5D-D01N-GRWD	No	Total Organic Carbon (TOC) was recovered outside the acceptance range of 75-125% for the matrix spike analysis on sample EW-5D-T01N-GRW (136%). Accordingly, the TOC sample result for this parent sample was qualified as estimated (J) with a high bias direction assigned. All matrix spike recoveries for metal analytes were recovered within the prescribed acceptance range. As such, none of results for metal analytes in either of the two parent samples were qualified on the basis of matrix spike recoveries. Despite the fact that the laboratory duplicate summary forms reported RPDs in excess of the evaluation criterion for several analytes, no qualification of data was necessary when the CRDL was used in place of the IDL, adjusted for dilution, for the concentration-dependent comparison calculations. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC Surrogates Serial Dilution (C) EW-5D-T01N-GRW EW-5D-D01N-GRW Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analyses run on the matrix spikes of samples EW-5D-T01N-GRW and EW-5D-D01N-GRW were applicable for 17 of the 24 analytes. The remaining seven analytes for each of the two samples were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. The serial dilution analysis run on sample EW-5D-D01N-GRW resulted in the qualification of cadmium and vanadium in this parent sample, as both analytes were applicable and reported %Ds in excess of 10%: Cadmium (11.3%), and Vanadium (10.1%). Since the %D for Vanadium rounds to 10%, no qualification of vanadium results on the basis of serial dilution was considered necessary. The cadmium result for sample EW-5D-D01N-GRW was qualified as estimated (UJ) with a low bias direction assigned, as the initial sample result was less than the diluted sample result. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. Eight sample results were qualified as a result of total vs partial comparisons. Table 1.3 summarizes the samples and resultant qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances
Field QC Field Duplicate MW-12-T01D-GRW MW-12-D01D-GRW Rinsate Blank	Yes	Field duplicate samples were assessed for overall precision of the analyses. As both field duplicate pairs met the criteria set forth in the QAPP, no qualification of data was necessary on the basis of field duplicate disagreement. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
MW-20-T01N-GRW	2.1 J	---	---	379 J	7.7 J
MW-A-T01N-GRW	R	0.0050 UJ	0.010 UJ	934 J	7.3 J
MW-12-T01N-GRW	0.44 J	---	---	243 J	8.2 J
LS1-T01N-GRW	029 J	---	0.014 J	378 J	7.0 J
LS2-T01N-GRW	0.30 J	0.0050 UJ	0.010 UJ	346 J	6.9 J
LS3-T01N-GRW	0.34 J	0.0050 UJ	0.010 UJ	312 J	6.8 J
MW-15-T01N-GRW	0.43 J	---	---	1680 J	7.2 J
MW-12-T01D-GRW	0.47 J	---	---	255 J	8.2 J
OUTFALL002PIPE-T01N-GRW	0.32 J	0.0050 UJ	0.010 UJ	1370 J	7.7 J
EW-5D-T01N-GRW	0.27 J	---	0.017 J	1640 J	7.4 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Beryllium (P)	---	0.2	---	---	---	1.2	LS3-D01N-GRW MW-12-D01D-GRW MW-12-T01D-GRW MW-15-D01N-GRW OUTFALL002PIPE-T01N-GRW	U CCB-I
Boron (P)	---	---	-3.0	---	---	1.8	LS2-D01N-GRW LS2-T01N-GRW LS3-D01N-GRW LS3-T01N-GRW MW-12-D01D-GRW MW-12-T01D-GRW	J CCB-L
Cadmium (P)	---	---	-0.6	---	---	0.3	LS2-D01N-GRW LS2-T01N-GRW LS3-D01N-GRW LS3-T01N-GRW MW-12-D01D-GRW MW-12-T01D-GRW MW-15-D01N-GRW MW-15-T01N-GRW OUTFALL002PIPE-D01N-GRW OUTFALL002PIPE-T01N-GRW	UJ CCB-L
Chromium (P)	---	---	-1.3	---	---0.8		EW-5D-D01N-GRW EW-5D-T01N-GRW LS2-D01N-GRW LS2-T01N-GRW LS3-D01N-GRW LS3-T01N-GRW MW-12-D01D-GRW MW-12-T01D-GRW MW-15-D01N-GRW MW-15-T01N-GRW OUTFALL002PIPE-D01N-GRW OUTFALL002PIPE-T01N-GRW	J CCB-L UJ CCB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Cobalt (P)	---	---	-1.2	---	---	1.1	EW-5D-D01N-GRW EW-5D-T01N-GRW LS2-D01N-GRW LS2-T01N-GRW LS3-D01N-GRW LS3-T01N-GRW MW-12-D01D-GRW MW-12-T01D-GRW MW-15-D01N-GRW MW-15-T01N-GRW OUTFALL002PIPE-D01N-GRW OUTFALL002PIPE-T01N-GRW	J CCB-L UJ CCB-L
Copper (P)	---	---	-3.4	---	---	0.70	EW-5D-D01N-GRW EW-5D-T01N-GRW LS2-D01N-GRW LS2-T01N-GRW LS3-D01N-GRW LS3-T01N-GRW MW-12-D01D-GRW MW-12-T01D-GRW MW-15-D01N-GRW MW-15-T01N-GRW OUTFALL002PIPE-D01N-GRW OUTFALL002PIPE-T01N-GRW	J CCB-L UJ CCB-L
Molybdenum (P)	1.1	1.1	---	1.4	---	1.0	EW-5D-D01N-GRW EW-5D-T01N-GRW MW-12-D01N-GRW MW-12-T01D-GRW MW-15-D01N-GRW MW-20-D01N-GRW MW-20-T01N-GRW	U CCB-I
Potassium (P)	173.8	---	-149.4	1213.0	149.2	109.3	EW-5D-D01N-GRW EW-5D-T01N-GRW	U CCB-I
Silver (MS)	-0.1	-0.1	-0.1	-0.1	-0.104	0.20	All sample results were qualified	UJ MB,CCB-L
Sodium (P)	-395.8	-668.5	-528.5	-364.3	-4585	327.5	LS1-D01N-GWR LS1-T01N-GRW LS2-D01N-GRW LS2-T01N-GRW LS3-D01N-GRW LS3-T011N-GRW MW-12-D01D-GRW MW-12-D01N-GRW MW-12-T01D-GRW MW-12-T01N-GRW MW-20-D01N-GRW MW-20-T01N-GRW	J MB,CCB-L UJ MB,CCB-L

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Total Metals (µgL)	Dissolved Metals (µg/L)	IDL (µg/L)	Criteria	Qualification Codes
EW-5D-T01N-GRW EW-5D-D01N-GRW	Cobalt	1.1 U	4.0	1.1	|Diff|>2xRL	J/UJ TvP-I
MW-15-T01N-GRW MW-15-D01N-GRW	Cobalt	1.1 U	3.9	1.1	|Diff|>2xRL	J/UJ TvP-I
MW-20-T01N-GRW MW-20-D01N-GRW	Sodium	3280	16800	3280	|Diff|>2xRL	J TvP-I
MW-A-T01N-GRW MW-A-D01N-GRW	Molybdenum	24.6	41.4	1.0	D 30%>T	J TvP-I

IDL = Instrument Detection Limit ND=Non-Detect D =Dissolved T=Total

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT278C Sampling Event: April 2004 GRW and SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Brian Olmsted Date Completed: 5-18-04

Peer Reviewer: Stacey Coker Date Completed: 5-20-04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
002PUMPBACK-T01N-GRW	SA	567387	002PUMPBACK-T01N-GR	W	X	X
002PUMPBACK-D01N-GRW	SA	567388	002PUMPBACK-D01N-GR	W	X	
OUTFALL002-T01N-GRW	SA	567389		W	X	X
OUTFALL002-D01N-GRW	SA	567390		W	X	
MW-22-T01N-GRW	SA	567391		W	X	X
MW-22-D01N-GRW	SA	567392		W	X	
MW-23-T01N-GRW	SA	567393		W	X	X
MW-23-D01N-GRW	SA	567394		W	X	
MW-7A-T01N-GRW	SA	567395		W	X	X
MW-7A-D01N-GRW	SA	567396		W	X	
MW-13-T01N-GRW	SA	567465		W	X	X
MW-13-D01N-GRW	SA	567466		W	X	
MW-17-T01N-GRW	SA	567467		W	X	X
MW-17-D01N-GRW	SA	567468		W	X	
MW-25-T01N-GRW	SA	567469		W	X	X
MW-25-D01N-GRW	SA	567470		W	X	

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

As noted in the laboratory case narrative, the associated continuing calibration blanks (CCBs) for the chloride analyses of the samples in this delivery group exhibited percent recoveries that were slightly above the reporting limit but well below the QAPP reporting limits. It has been verified that all of the CCBs in this delivery group contained chloride concentrations between 0.32 and 0.52 mg/L (laboratory reporting limit is 0.2 mg/L, QAPP reporting limit is 5.0 mg/L). Chloride concentrations for field samples

reported in this data package range from 2.6 to 17.5 mg/L. Because sample concentrations are greater than five times the CCB concentrations, data qualification based on CCBs was not considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken six days after sampling for samples collected on 4/14/04 and seven days after sampling for samples collected on 4/15/04. The pH measurements were taken 7.5 hours beyond log-in for samples collected on 4/14/04 and 2 hours beyond log-in for samples collected on 4/15/04. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD PDS LD	N/A	The matrix quality control results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (C) 002PUMPBACK-T01N-GRWL Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analysis on 002PUMPBACK-T01N-GRW was applicable for 4 of the 24 metal analytes. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. All four applicable serial dilution results were within QC acceptance criteria. The serial dilution results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. Table 1.3 lists the total versus partial results outside acceptance criteria. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within the acceptance range of 0.5 and 1.5.
Field QC Field Duplicate Rinsate Blank Field Blank Trip Blank	N/A	The field QC results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.
Laboratory Performance Parameters	Complete with "Yes", "No", or "N/A".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	The laboratory control sample duplicate result performed on 4/28/04 for total organic carbon exceeded the RPD criteria of 20% with a reported value of 23%, although the percent recovery for both the laboratory control sample and duplicate sample was within QC acceptance limits. For the samples analyzed for TOC on 4/28/04, qualification was assigned as estimate (J/UJ) with an indeterminate bias based on duplicate disagreement (D).
Compound Identification	N/A	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	No	The inorganic parameters summary sheets for samples 002PUMPBACK-T01N-GRW and MW-7A-T01N-GRW incorrectly reported the TOC dilution factor as 2.0. According to the raw data, the analyses were performed at a dilution factor of 1.0. However, since the samples were qualified as nondetect based on blank detections, the reporting levels will already be elevated.
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	Yes	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Orthophosphate (mg/L)	Cond. (µmhos/cm)	pH (std units)
002PUMPBACK-T01N-GRW	0.20 UJ	0.0050 UJ	0.100 J	1500 J	7.5 J
OUTFALL002-T01N-GRW	0.32 J	0.0050 UJ	0.047 J	1440 J	7.6 J
MW-22-T01N-GRW	0.52 J	0.0050 UJ	0.010 UJ	204 J	8.3 J
MW-23-T01N-GRW	1.1 J	0.0050 UJ	0.010 UJ	402 J	8.1 J
MW-7A-T01N-GRW	0.43 J	0.0050 UJ	0.029 J	1390 J	7.3 J
MW-13-T01N-GRW	0.72 J	---	---	586 J	8.3 J
MW-17-T01N-GRW	0.47 J	---	---	602 J	7.8 J
MW-25-T01N-GRW	0.49 J	0.0050 UJ	0.017 J	239 J	8.4 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Total Organic Carbon DF=1	U	1123	1330	1294	---	U	1000	002PUMPBACK-T01N-GRW OUTFALL002-T01N-GRW MW-22-T01N-GRW MW-23-T01N-GRW MW-7A-T01N-GRW	U CCB-I
Aluminum DF=10	U	U	-31.0	U	22.7	-18.080	17.6	All samples in this data package	UJ MB,CCB-L
Beryllium DF=1	0.2	0.2	U	---	---	U	0.2	002PUMPBACK-T01N-GRW MW-23-T01N-GRW MW-23-D01N-GRW MW-7A-T01N-GRW MW-7A-D01N-GRW MW-13-T01N-GRW MW-17-T01N-GRW	U CCB-I
Cadmium DF=1	U	U	-0.4	---	---	U	0.3	MW-23-T01N-GRW MW-23-D01N-GRW MW-7A-T01N-GRW MW-7A-D01N-GRW MW-13-T01N-GRW MW-13-D01N-GRW MW-17-T01N-GRW MW-17-D01N-GRW MW-25-T01N-GRW MW-25-D01N-GRW	UJ CCB-L
Chromium DF=1	U	0.8	U	---	---	0.883	0.8	All samples in this data package	U MB,CCB-I or U MB-I
Cobalt DF=1	1.2	1.2	U	---	---	U	1.1	002PUMPBACK-D01N-GRW OUTFALL002-D01N-GRW MW-22-D01N-GRW MW-23-D01N-GRW MW-7A-T01N-GRW MW-7A-D01N-GRW MW-17-D01N-GRW MW-25-D01N-GRW	U CCB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Copper DF=1	-2.9	-1.9	-5.0	---	---	-1.345	0.7	All samples in this data package	UJ MB,CCB-L
Iron DF=10	U	U	-19.6	U	U	U	19.2	002PUMPBACK-T01N-GRW 002PUMPBACK-D01N-GRW OUTFALL002-T01N-GRW OUTFALL002-D01N-GRW MW-22-T01N-GRW MW-22-D01N-GRW MW-23-T01N-GRW MW-23-D01N-GRW MW-7A-T01N-GRW	UJ CCB-L
Silver DF=2	-0.2	-0.2	-0.2	---	---	-0.307	0.1	All samples in this data package	UJ MB,CCB-L
Potassium DF=1	-1164.0	-303.4	---	---	---	-1282.0	109.3	002PUMPBACK-T01N-GRW 002PUMPBACK-D01N-GRW OUTFALL002-T01N-GRW OUTFALL002-D01N-GRW MW-22-T01N-GRW MW-22-D01N-GRW	J MB,CCB-L
Potassium DF=1	121.2	1375.0	---	---	---	-1282.0	109.3	MW-23-T01N-GRW MW-23-D01N-GRW MW-7A-T01N-GRW MW-7A-D01N-GRW MW-13-T01N-GRW MW-13-D01N-GRW MW-17-T01N-GRW MW-17-D01N-GRW MW-25-T01N-GRW MW-25-D01N-GRW	U CCB-I or UJ MB,CCB-I
Vanadium DF=2	0.2	0.2	0.2	---	---	0.454	0.2	002PUMPBACK-T01N-GRW 002PUMPBACK-D01N-GRW OUTFALL002-T01N-GRW OUTFALL002-D01N-GRW MW-7A-T01N-GRW MW-7A-D01N-GRW MW-17-T01N-GRW MW-17-D01N-GRW	J MB,CCB-L
Sodium DF=10	U	379.7	596.4	219.8	227.4	-1100.0	172.6	MW-22-T01N-GRW MW-22-D01N-GRW MW-23-T01N-GRW MW-23-D01N-GRW MW-7A-T01N-GRW MW-13-T01N-GRW MW-13-D01N-GRW MW-25-T01N-GRW MW-25-D01N-GRW	UJ MB,CCB-I or J MB-L
Zinc DF=10	U	U	U	U	U	1.56	1.5	002PUMPBACK-T01N-GRW MW-7A-T01N-GRW MW-17-T01N-GRW MW-17-D01N-GRW	U MB-I

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit U=Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications

Sample	Analyte	Dissolved (µg/L)	Total (µg/L)	Adjusted RL (µg/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
MW-7A-T/D01N-GRW	Sodium	61800	37500	1726	Diff. > 30%	49%	J TvP-I
MW-25-T/D01N-GRW	Sodium	32400	17900	1726	Diff. > 30%	58%	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT279C Sampling Event: April 2004 GRW and SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 5-19-04

Peer Reviewer: Stacey Coker Date Completed: 5-20-04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics
MW-26-T01N-GRW	SA	567482		W	X	X
MW-26-D01N-GRW	SA	567483		W	X	
MW-28-T01N-GRW	SA	567484		W	X	X
MW-28-D01N-GRW	SA	567485		W	X	
MW-29-T01N-GRW	SA	567486		W	X	X
MW-29-D01N-GRW	SA	567487		W	X	
SPRING18-T01N-GRW	SA	567488		W	X	X
SPRING18-D01N-GRW	SA	567489		W	X	
EASTSEEP-T01N-GRW	SA	567490		W	X	X
EASTSEEP-D01N-GRW	SA	567491		W	X	
SPRING15T-T01N-GRW	SA	567492		W	X	X
SPRING15T-D01N-GRW	SA	567493		W	X	
SPRING17-T01N-GRW	SA	567494		W	X	X
SPRING17-D01N-GRW	SA	567495		W	X	
SPRING9A-T01N-GRW	SA	567496		W	X	X
SPRING9A-D01N-GRW	SA	567497		W	X	
SPRING9-T01N-GRW	SA	567498		W	X	X
SPRING9-D01N-GRW	SA	567499		W	X	
SPRING10-T01N-GRW	SA	567500		W	X	X
SPRING10-D01N-GRW	SA	567501		W	X	

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues not already addressed in the review table below, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

As noted in the laboratory case narrative, the associated continuing calibration blanks (CCBs) for the chloride analyses of the samples in this delivery group exhibited percent recoveries that were slightly

above the reporting limit but well below the QAPP reporting limits. It has been verified that all of the CCBs in this delivery group contained chloride concentrations between 0.32 and 0.52 mg/L (laboratory reporting limit is 0.2 mg/L, QAPP reporting limit is 5.0 mg/L). Chloride concentrations for field samples reported in this data package range from 4.4 to 17.5 mg/L. Because sample concentrations are greater than five times the CCB concentrations, data qualification based on CCBs is not considered necessary.

It was noted that during the original nitrate analyses of the samples in this delivery group, the associated calibration check standards exhibited marginally elevated percent recoveries. The samples with no detectable nitrate above the reporting limit were reported from this sequence. The remaining samples were reanalyzed 4 days beyond the holding time yielded acceptable results. It is believed that this statement was erroneously added to this data package because no samples were analyzed for nitrate 4 days after the holding time and the calibration check standards did not have elevated percent recoveries.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, samples MW-26-T01N-GRW, MW-29-T01N-GRW, SPRING18-T01N-GRW, EASTSEEP-T01N-GRW, SPRING15T-T01N-GRW, SPRING17-T01N-GRW, SPRING9A-T01N-GRW, SPRING9-T01N-GRW and SPRING10-T01N-GRW for cyanide analysis were received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect results for these samples were qualified as estimated (UJ), with an indeterminate bias direction.
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken four days beyond log-in. The pH measurements were taken 2 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various analytes were detected in the preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD SPRING17-T01N-GRW SPRING17-D01N-GRW PDS SPRING17-T01N-GRW SPRING17-D01N-GRW LD SPRING17-T01N-GRW SPRING17-D01N-GRW	No	Table 1.3 and 1.4 list the matrix spike and laboratory duplicate results outside QC acceptance limits, respectively. The matrix quality control results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC Surrogates Serial Dilution (C) SPRING17-T01N-GRWS SPRING17-D01N-GRWS Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analyses on the spiked samples of SPRING17-T01N-GRW and SPRING17-D01N-GRW were applicable for 16 of the 24 metal analytes for each sample. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. Table 1.5 lists the serial dilution results outside QC acceptance limits. The serial dilution results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. Table 1.6 lists the total versus partial results outside acceptance criteria. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within the acceptance range of 0.5 and 1.5.
Field QC Field Duplicate Rinsate Blank Field Blank Trip Blank	N/A	The field QC results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Orthophosphate (mg/L)	Cond. (µmhos/cm)	pH (std units)
MW-26-T01N-GRW	1.6 J	---	0.14 J	1540 J	7.3 J
MW-28-T01N-GRW	0.50 J	---	---	1250 J	7.4 J
MW-29-T01N-GRW	0.47 J	---	---	1540 J	7.4 J
SPRING18-T01N-GRW	0.62 J	0.0050 UJ	0.013 J	291 J	8.5 J
EASTSEEP-T01N-GRW	---	0.0050 UJ	0.010 UJ	1770 J	7.7 J
SPRING15T-T01N-GRW	0.60 J	0.0050 UJ	0.012 J	397 J	8.4 J
SPRING17-T01N-GRW	0.63 J	0.0050 UJ	0.012 J	352 J	7.5 J
SPRING9A-T01N-GRW	0.90 J	---	---	1360 J	7.5 J
SPRING9-T01N-GRW	0.82 J	---	---	1370 J	7.3 J
SPRING10-T01N-GRW	0.52 J	---	---	480 J	8.1 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Total Organic Carbon DF=1	1081	1106	U	---	U	1000	All samples in this data package	U CCB-I
Chromium DF=1	U	U	U	U	0.809	0.8	MW-26-T01N-GRW MW-28-T01N-GRW MW-28-D01N-GRW MW-29-T01N-GRW MW-29-D01N-GRW SPRING18-T01N-GRW SPRING18-D01N-GRW EASTSEEP-D01N-GRW SPRING15T-T01N-GRW SPRING15T-D01N-GRW SPRING17-T01N-GRW SPRING9A-T01N-GRW SPRING9A-D01N-GRW SPRING9-D01N-GRW SPRING10-T01N-GRW	U MB-I
Cobalt DF=1	U	U	U	U	-1.3	1.1	All samples in this data package	UJ MB-L or J MB-L
Copper DF=1	U	1.2	U	U	1.895	0.7	MW-26-T01N-GRW MW-26-D01N-GRW MW-28-T01N-GRW MW-28-D01N-GRW MW-29-T01N-GRW MW-29-D01N-GRW SPRING18-T01N-GRW SPRING18-D01N-GRW EASTSEEP-T01N-GRW EASTSEEP-D01N-GRW SPRING17-T01N-GRW SPRING17-D01N-GRW SPRING9A-T01N-GRW	U CCB,MB-I or U MB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
							SPRING9A-D01N-GRW SPRING9-T01N-GRW SPRING9-D01N-GRW SPRING10-T01N-GRW SPRING10-D01N-GRW	
Manganese DF=10	U	U	-1.5	U	U	1.4	EASTSEEP-T01N-GRW SPRING15T-T01N-GRW SPRING15T-D01N-GRW SPRING17-T01N-GRW SPRING17-D01N-GRW SPRING9A-T01N-GRW SPRING9A-D01N-GRW SPRING9-T01N-GRW SPRING9-D01N-GRW SPRING10-T01N-GRW SPRING10-D01N-GRW	J CCB-L or UJ CCB-L
Nickel DF=1	U	U	-1.4	U	-1.897	1.4	All samples in this data package	UJ MB-L or J MB-L or UJ CCB,MB-L
Silver DF=2	0.2	0.2	0.2	0.2	0.338	0.1	All samples in this data package	U CCB,MB-I
Sodium DF=10	-1382.0	- 1282.0	-727.2	-1475.0	-1564.0	327.5	MW-26-T01N-GRW MW-26-D01N-GRW MW-28-T01N-GRW MW-28-D01N-GRW MW-29-T01N-GRW MW-29-D01N-GRW SPRING18-T01N-GRW SPRING18-D01N-GRW SPRING15T-T01N-GRW SPRING15T-D01N-GRW SPRING17-T01N-GRW SPRING17-D01N-GRW SPRING9A-T01N-GRW SPRING9A-D01N-GRW SPRING9-T01N-GRW SPRING9-D01N-GRW SPRING10-T01N-GRW SPRING10-D01N-GRW	J CCB,MB-L or UJ CCB,MB-L or J MB-L
Zinc DF=10	U	U	U	U	7.405	2.4	MW-28-D01N-GRW SPRING18-D01N-GRW SPRING9A-T01N-GRW SPRING10-D01N-GRW	U MB-I

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit U=Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	%Recovery	Criteria	Action
SPRING17-T01N-GRW						
Total Organic Carbon	1.4	13.8	8.3	149%	75-125%	J MS-H

NA = Not appropriate

Table 1.4
Laboratory Duplicate Results and Parent Sample Qualifications

Analyte	Result (µg/L)	Duplicate (µg/L)	CRDL* (µg/L)	Criterion	Criteria Exceedance	Qualification
SPRING17-T01N-GRW						
Sodium	3275 U	11010	5000	Diff > 1xRL	1.5xCRDL	UJ D-I
SPRING17-D01N-GRW						
Sodium	3275 U	19330	5000	Diff > 1xRL	3.2xCRDL	UJ D-I

*CRDL used in place of the RL for metal analytes

Table 1.5
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	Sample Result (µg/L)	Serial Dilution Result (µg/L)	%D	Qualification
SPRING17-T01N-GRWS				
Silver	20.69	23.11	11.7	J DL-L
Vanadium	46.37	41.69	10.1	No qualification, 10.1 rounds to 10.0.
SPRING17-D01N-GRWS				
Vanadium	47.48	42.48	10.5	No qualification, sample result is nondetect.

Table 1.6
Total vs. Partial Qualifications

Sample	Analyte	Dissolved (µg/L)	Total (µg/L)	Adjusted RL (µg/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
SPRING9-T/D01N-GRW	Sodium	44000	30100	3275	Diff. > 30%	38%	J TvP-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT280C Sampling Event: April 2004 GRW and SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 5-20-04

Peer Reviewer: Stacey Coker Date Completed: 5-24-04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
SPRING14T-T01N-GRW	SA	567502		W	X	X
SPRING14T-D01N-GRW	SA	567503		W	X	
SPRING12A-T01N-GRW	SA	567504		W	X	X
SPRING12A-D01N-GRW	SA	567505		W	X	
SPRING12-T01N-GRW	SA	567506		W	X	X
SPRING12-D01N-GRW	SA	567507		W	X	
003CENTRALSEEP-T01N-GRW	SA	567508	3CENTRALSEEP-T01N-GRW 3CENTRALSEEP-T01N-G	W	X	X
003CENTRALSEEP-D01N-GRW	SA	567509	3CENTRALSEEP-D01N-GRW 3CENTRALSEEP-D01N-G	W	X	
003WESTSEEP-T01N-GRW	SA	567510	003WESTSEEP-T01N-GR	W	X	X
003WESTSEEP-D01N-GRW	SA	567511	003WESTSEEP-D01N-GR	W	X	
RB06T-GRW	RB	567512		W	X	X
RB06D-GRW	RB	567513		W	X	
MW-24-T01N-GRW	SA	567514		W	X	X
MW-24-D01N-GRW	SA	567515		W	X	
003EASTSEEP-T01N-GRW	SA	567516	003EASTSEEP-T01N-GR	W	X	X
003EASTSEEP-D01N-GRW	SA	567517	003EASTSEEP-D01N-GR	W	X	
EMBARGOROADSEEP-T01N-GRW	SA	567518	EMBRGORDSEEP-T01N-GRW EMBRGORDSEEP-T01N-	W	X	X
EMBARGOROADSEEP-D01N-GRW	SA	567519	EMBRGORDSEEP-D01N-GRW EMBRGORDSEEP-D01N-	W	X	
COMPANYCABINSWELL-T01N-GRW	SA	567520	COMPCABSWELL-T01N-GRW COMPCABSWELL-T01N-	W	X	X
COMPANYCABINSWELL-D01N-GRW	SA	567542	COMPCABSWELL-D01N-GRW COMPCABSWELL-D01N-	W	X	

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues not already addressed in the review table below, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

It was noted that during the original nitrate analyses of the samples in this delivery group, the associated calibration check standards exhibited marginally elevated percent recoveries. The samples with no detectable nitrate above the reporting limit were reported from this sequence. The remaining samples were reanalyzed 2 to 3 days beyond the holding time yielded acceptable results.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, samples SPRING14T-T01N-GRW, SPRING12A-T01N-GRW, SPRING12-T01N-GRW, 003CENTRALSEEP-T01N-GRW, 003WESTSEEP-T01N-GRW, EMBARGOROADSEEP-T01N-GRW and COMPANYCABINSWELL-T01N-GRW for cyanide analysis were received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The results for these samples were qualified as estimated (J/UJ), with an indeterminate bias direction.
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken four days beyond log-in. The pH measurements were taken 2 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various analytes were detected in the preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD PDS LD	N/A	The matrix quality control results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (C) SPRING14T-T01N-GRW Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analysis performed on sample SPRING14T-T01N-GRW was applicable for 0 of the 24 metal analytes. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The serial dilution results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. Table 1.3 lists the total versus partial results outside acceptance criteria. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within the acceptance range of 0.5 and 1.5 except for RB06T-GRW which yielded a TDS ratio of 2.92. No qualification was applied because the high TDS ratio is a result of the elevated metals reporting levels.

Review Parameter	Criteria Met?	Comments
Field QC Field Duplicate Rinsate Blank RB06T-GRW RB06D-GRW Field Blank Trip Blank	N/A	Table 1.4 lists the rinsate blank detections found. The field QC results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Orthophosphate (mg/L)	Cond. (µmhos/cm)	pH (std units)
SPRING14T-T01N-GRW	0.48 J	0.0050 UJ	0.014 J	227 J	8.3 J
SPRING12A-T01N-GRW	0.51 J	0.0050 UJ	0.014 J	414 J	8.1 J
SPRING12-T01N-GRW	0.50 J	---	0.011 J	459 J	8.2 J
003CENTRALSEEP-T01N-GRW	0.25 J	---	---	2350 J	7.7 J
003WESTSEEP-T01N-GRW	0.20 UJ	---	0.022 J	2160 J	7.9 J
RB06T-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	0.19 J	6.3 J
MW-24-T01N-GRW	1.3 J	0.0050 UJ	0.011 J	321 J	7.5 J
003EASTSEEP-T01N-GRW	0.20 UJ	---	---	1940 J	7.9 J
EMBARGOROADSEEP-T01N-GRW	0.59 J	0.0050 UJ	0.018 J	1430 J	7.5 J
COMPANYCABINSWELL-T01N-GRW	0.38 J	0.0050 UJ	0.010 UJ	174 J	7.3 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Chloride DF=1	475	386	522	---	---	440	200	RB06T-GRW COMPANYCABINSWELL-T01N-GRW	U CCB,MB-I
Total Organic Carbon DF=1	U	1081	1106	---	---	U	1000	MW-24-T01N-GRW 003EASTSEEP-T01N-GRW EMBARGOROADSEEP-T01N-GRW COMPANYCABINSWELL-T01N-GRW	U CCB-I
Aluminum DF=10	U	U	U	42.1	---	18.6	17.6	SPRING12A-T01N-GRW SPRING12-T01N-GRW 003EASTSEEP-T01N-GRW 003EASTSEEP-D01N-GRW EMBARGOROADSEEP-T01N-GRW COMPANYCABINSWELL-D01N-GRW	U MB-I or U CCB,MB-I
Beryllium DF=1	U	U	0.3	U	---	U	0.2	COMPANYCABINSWELL-T01N-GRW COMPANYCABINSWELL-D01N-GRW	U CCB-I
Cadmium DF=1	0.4	U	0.4	U	---	U	0.3	RB06D-GRW 003EASTSEEP-T01N-GRW COMPANYCABINSWELL-T01N-GRW COMPANYCABINSWELL-D01N-GRW	U CCB-I
Chromium DF=1	U	U	U	1.0	---	U	0.8	EMBARGOROADSEEP-T01N-GRW EMBARGOROADSEEP-D01N-GRW COMPANYCABINSWELL-T01N-GRW COMPANYCABINSWELL-D01N-GRW	U CCB-I
Copper DF=1	U	U	U	1.1	---	U	0.7	EMBARGOROADSEEP-T01N-GRW EMBARGOROADSEEP-D01N-GRW COMPANYCABINSWELL-T01N-GRW COMPANYCABINSWELL-D01N-GRW	U CCB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Iron DF=10	-43.2	U	U	-23.8	---	U	19.2	SPRING14T-T01N-GRW SPRING14T-D01N-GRW SPRING12A-T01N-GRW SPRING12A-D01N-GRW SPRING12-T01N-GRW SPRING12-D01N-GRW EMBARGOROADSEEP-D01N-GRW COMPANYCABINSWELL-T01N-GRW	UJ CCB-L or J CCB-L
Molybdenum DF=1	U	1.6	1.2	U	---	5.54	1.0	003WESTSEEP-T01N-GRW 003WESTSEEP-D01N-GRW RB06T-GRW MW-24-T01N-GRW MW-24-D01N-GRW 003EASTSEEP-T01N-GRW 003EASTSEEP-D01N-GRW COMPANYCABINSWELL-T01N-GRW COMPANYCABINSWELL-D01N-GRW	U CCB-I or U CCB,MB-I
Potassium DF=1	144.9	U	196.6	238.9	---	-191.2	109.3	RB06T-GRW RB06D-GRW COMPANYCABINSWELL-T01N-GRW COMPANYCABINSWELL-D01N-GRW	UJ MB-I or U CCB-I
Silver DF=2	0.4	0.4	0.4	0.4	0.4	0.878	0.1	All samples in this data package	U CCB,MB-I
Sodium DF=10	U	176.5	175.8	-188.2	---	U	172.6	RB06T-GRW COMPANYCABINSWELL-T01N-GRW COMPANYCABINSWELL-D01N-GRW	U CCB-I or UJ CCB-I

MS = Mass Spect P= ICP CCBx = Continuing Calibration Blank IDL= Instrument Detection Limit U=Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications

Sample	Analyte	Dissolved (µg/L)	Total (µg/L)	Adjusted RL (µg/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
SPRING14T-T/D01N-GRW	Cobalt	4.8	1.1 U	1.1	Diff. > 2xRL	3.4xRL	J/UJ TvP-I
	Zinc	50.0	15.0 U	15	Diff. > 2xRL	2.3xRL	

Table 1.4
Rinsate Blank Detections

Analyte	RL (mg/L)	Concentration (mg/L)
RB06T-GRW		
Total Dissolved Solids	5.0	7.0
Total Suspended Solids	0.5	1.7
Bicarbonate Alkalinity	1.0	2.9
Total Alkalinity	1.0	2.9
Chromium	0.0008	0.0017
RB06D-GRW		
Copper	0.0007	0.00071

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT281C Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike Date Completed: 05/25/04

Peer Reviewer: Stacey Coker Date Completed: 06/04/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics
WESTSEEP-T01N-GRW	SA	567522		W	X	X
WESTSEEP-D01N-GRW	SA	567523		W	X	
MW-7C-T01N-GRW	SA	567524		W	X	X
MW-7C-D01N-GRW	SA	567525		W	X	
MW-CH-T01N-GRW	SA	567526		W	X	X
MW-CH-D01N-GRW	SA	567527		W	X	
MW-11-T01N-GRW	SA	567528		W	X	X
MW-11-D01N-GRW	SA	567529		W	X	
MW-2-T01N-GRW	SA	567530		W	X	X
MW-2-D01N-GRW	SA	567531		W	X	
MW-10-T01N-GRW	SA	567532		W	X	X
MW-10-D01N-GRW	SA	567533		W	X	
LABWELL-T01N-GRW	SA	567534		W	X	X
LABWELL-D01N-GRW	SA	567535		W	X	
LABWELL-T01D-GRW	FD	567536		W	X	X
LABWELL-D01D-GRW	FD	567537		W	X	
MMW-43A-T01N-GRW	SA	567538		W	X	X
MMW-43A-D01N-GRW	SA	567539		W	X	
FAGERQUISTWELL-T01N-GRW	SA,MS,LD	567540	FAGERWELL-T01N-GRW	W	X	X
FAGERQUISTWELL-D01N-GRW	SA, MS, LD	567541	FAGERWELL-D01N-GRW	W	X	

Matrix: W = Water QC Type: SA = Sample

FD = Field Duplicate MS= Matrix Spike LD=Laboratory Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative notes that during the chloride analysis from 04/21/04, the initial and continuing calibration blanks yielded concentrations that were slightly above the reporting limit. The laboratory reported chloride results greater than 10x the blank concentrations from this sequence. The remaining samples were reanalyzed on 04/27/04 yielding similar results. Therefore, the reanalyses results from 04/27/04 were reported.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	For samples FAGERQUISTWELL-T01N-GRW and FAGERQUISTWELL-D01N-GRW, the sampling dates and times were taken from the labels because they were inadvertently not recorded on the COC.
Holding Times	No	The majority of sample results for nitrate were qualified as estimated (J). Samples were analyzed in excess of 48 hours, but less than 2x the prescribed analytical holding time. Accordingly, it was not necessary to consider rejecting nondetect results. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 5-6 days after sampling and four days beyond log-in. The pH for the same samples were measured approximately 1-2 days beyond sampling. Therefore, all conductivity and pH results were qualified as estimated (J). Sample MMW-43A-T01N-GRW was outside criteria for the ratio of calculated versus measured TDS. The sample was analyzed outside holding time with acceptable results. The TDS result for sample MMW-43A-T01N-GRW was qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Chloride was detected in the method blank run on 04/21/04 and 04/27/04. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD FAGERQUISTWELL-T01N-GRW FAGERQUISTWELL-D01N-GRW LD FAGERQUISTWELL-T01N-GRW FAGERQUISTWELL-D01N-GRW	No	Sulfate, total organic carbon (TOC), and iron were recovered outside the acceptance range of 75-125% for matrix spike analyses. Table 1.3 summarizes these recoveries and resultant data qualifications assigned. All laboratory duplicate %RPDs were within evaluation criteria, therefore, no qualifications of data were necessary. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC Surrogates Serial Dilution (C) FAGERQUISTWELL-T01N-GRW FAGERQUISTWELL-D01N-GRW Total vs. Partial Analyses Cation/Anion Balance Internal Standards	Yes	The serial dilution analyses run on the matrix spikes of samples FAGERQUISTWELL-T01N-GRW and FAGERQUISTWELL-D01N-GRW were applicable for only 13 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. No qualification of data results was necessary.. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances
Field QC Field Duplicate LABWELL-T01N-GRW/ LABWELL-T01D-GRW LABWELL-D01N-GRW LABWELL-DO1D-GRW Rinsate Blank	Yes	All field duplicate results were within evaluation criteria, therefore, no qualifications of data were necessary. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. All Parameters: Laboratory Control Sample Results All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Cond. (µmhos/cm)	pH (std units)	TDS (mg/L)
WESTSEEP-T01N-GRW		1560 J	7.5 J	
MW-7C-T01N-GRW	057 J	1440 J	7.3 J	
MW-CH-T01N-GRW	0.64 J	449 J	7.9 J	
MW-11-T01N-GRW	0.73 J	479 J	8.2 J	
MW-2-T01N-GRW		805 J	9.2 J	
MW-10-T01N-GRW	0.66 J	209 J	7.9 J	
LABWELL-T01N-GRW	0.46 J	322 J	7.3 J	
LABWELL-T01D-GRW	0.47 J	325 J	7.2 J	
MMW-43A-T01N-GRW		2040 J	7.1 J	2030 J
FAGERQUISTWELL-T01N-GRW		155 J	7.5 J	

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Chloride 04/27/04						044 mg/L	0.20	MW-CH-T01N-GRW MW-10-T01N-GRW FAGERWELL-T01N-GRW	U MB-I
Aluminum DF=10	-21.0	---	49.6	---	---	---	20.1	MMW-11-T01N-GRW MMW-11-D01N-GRW MW-7C-T01N-GRW MW-7C-D01N-GRW MW-CH-T01N-GRW MW-CH-D01N-GRW WESTSEEP-T01N-GRW WESTSEEP-D01N-GRW	J/UJ CCB-L
								FAGERWELL-T01N-GRW MMW-43A-T01N-GRW	U CCB-I
Antimony DF=2	0.5	0.5	0.5	0.5	0.5	0.976	0.4	All samples in this SDG	U CCB, MB-I or U MB-I
Beryllium DF=1	---	---	---	---	---	-0.460	0.3	All samples in this SDG	J/UJ MB-L
Iron DF=10	-52.8	---	81.3	---	---	---	29.3	FAGERQUISTWELL-T01N-GRW MW-11-T01N-GRW MW-11-D01N-GRW MW-7C-T01N-GRW MW-7C-D01N-GRW MW-CH-T01N-GRW MW-CH-D01N-GRW WESTSEEP-T01N-GRW WESTSEEP-D01N-GRW	J/UJ CCB-L
								MMW-43A-T01N-GRW MMW-43A-D01N-GRW MW-2-T01N-GRW	U CCB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Manganese DF=10	-2.6	---	4.1	-1.5	---	---	1.4	FAGERWELL-T01N-GRW FAGERWELL-D01N-GRW MW-11-T01N-GRW MW-11-D01N-GRW MW-7C-T01N-GRW MW-7C-D01N-GRW MW-CH-T01N-GRW MW-CH-D01N-GRW	UJ CCB-L
Molybdenum DF= 1	---	---	2.7	---	---	---	1.4	FAGERWELL-T01N-GRW FAGERWELL-D01N-GRW LABWELL-T01N-GRW LABWELL-T01D-GRW LABWELL-D01N-GRW LABWELL-D01D-GRW MMW-43A-T01N-GRW MMW-43A-D01N-GRW MW-10-T01N-GRW MW-10-D01N-GRW	U CCB-I
Nickel DF=1	---	---	---	---	---	-1.821	1.5	All samples in this SDG	J/UJ MB-L
Silver DF=2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.363	0.1	All samples in this SDG	UJ MB, CCB-L
Sodium DF=10	---	531.0	2351.0	---	---	-4125.0	327.5	MW-10-T01N-GRW MW-10-D01N-GRW MW-2-T01N-GRW MW-2-D01N-GRW MW-11-T01N-GRW MW-11-D01N-GRW LABWELL-T01N-GRW LABWELL-T01D-GRW LABWELL-D01N-GRW LABWELL-D01D-GRW MMW-43A-T01N-GRW MMW-43A-D01N-GRW MW-7C-T01N-GRW MW-7C-D01N-GRW MW-CH-T01N-GRW MW-CH-D01N-GRW WESTSEEP-T01N-GRW WESTSEEP-D01N-GRW	UJ MB,CCB-I
								FAGERWELL-T01N-GRW FAGERWELL-D01N-GRW	UJ MB-I
Thallium DF=2	0.1	0.1	0.1	0.1	0.1	0.219	0.1	All samples in this SDG	U CCB, MB-I

CV = Cold Vapor MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Parent Sample Qualification
FAGERQUISTWELL-T01N-GRW				
Sulfate	74%	NA	75-125	J MS-L
TOC	149%	NA		ND (NQ)
Iron	72.2%	101.1%		UJ MS-L

N/A = Not appropriate ND (NQ) = No Qualification due to nondetect result with high bias.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT282C Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike Date Completed: 06/01/04

Peer Reviewer: Stacey Coker Date Completed: 06/04/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses		
					Metals	Inorganics	TPH-DRO
DECANT-T01N-SFW	MS/MSD	567715	DECNT01N	W	X	X	X
DECANT-D01N-SFW	SA	567716		W	X		
DECANT-T01D-SFW	FD	567717	DECNTT01DSFW	W			X
RB01T-SFW	RB	567718		W			X

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate

MS/MSD= Matrix Spike/ Matrix Spike Duplicate RB=Rinsate blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	COD was inadvertently not requested on the COC form although it was specified on the W-3 sample labels. The laboratory logged the samples in for COD analysis. Additional NaOH was added to the cyanide container for sample DECANT-T01N-SFW because the pH was not >12 upon receipt. The associated cyanide result was qualified as estimated (UJ-P-I)
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurement for sample DECANT-T01N-SFW was taken five days after sampling and three days beyond log-in. The pH for the same sample was measured approximately two days beyond sampling. Therefore, the conductivity and pH results were qualified as estimated (J). The BOD analysis of sample DECANT-T01N-SFW was analyzed one day past holding time. The BOD results for sample DECANT-T01N-SFW was qualified as estimated (J).

Review Parameter	Criteria Met?	Comments
		Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD DECANT-T01N-SFW (TPH-DRO only) LD	Yes	All matrix spike recoveries were within evaluation criteria, therefore, no qualifications of data were necessary. All laboratory duplicate results were within evaluation criteria, therefore, no qualifications of data were necessary. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (C) DECANT-T01N-SFW Total vs. Partial Analyses Cation/Anion Balance Internal Standards	Yes	The serial dilution analyses run on the matrix spikes of sample DECANT-T01N-SFW was only applicable for 10 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. No qualification of data results was necessary.. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances
Field QC Field Duplicate DECANT-T01N-SFW/ DECANT-T01D-SFW (TPH-DRO only) Rinsate Blank RB02T-SFW (TPH-DRO only)	Yes	All field duplicate results were within evaluation criteria, therefore, no qualifications of data were necessary. All rinsate blank results were nondetect. No qualifications of data were necessary based on the rinsate blank review. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. All Parameters: Laboratory Control Sample Results. All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD (mg/L)	Cond. (µmhos/cm)	pH (std units)
DECANT-T01N-SFW	5.2 J	1990 J	7.6 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony DF=1	-0.7	-0.7	---	-0.776	0.40	DECANT-T01N-SFW DECANT-D01N-SFW	UJ CCB,MB-L
Cadmium DF=1	-0.2	---	---	---	0.20	DECANT-T01N-SFW DECANT-D01N-SFW	J CCB-L UJ CCB-L
Copper DF=1	-1.4	-1.4	---	-1.243	0.80	DECANT-T01N-SFW DECANT-D01N-SFW	J CCB-L UJ CCB-L
Iron DF=1	19.6	---	21.9	---	19.2	DECANT-D01N-SFW	U CCB-I
Silver DF=1	0.3	0.3	---	0.266	0.10	DECANT-T01N-SFW DECANT-D01N-SFW	U CCB-I

CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT283C Sampling Event: April 2004 GRW and SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Brian Olmsted Date Completed: 05-24-04

Peer Reviewer: Stacey Coker Date Completed: 05-26-04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses			
					Metals	Inorganics	VOCs	Explosives
MMW-30A-T01N-GRW	SA	567770		W	X	X		
MMW-30A-D01N-GRW	SA	567771		W	X			
MMW-42B-T01N-GRW	SA	567772		W	X	X		
MMW-42B-D01N-GRW	SA	567773		W	X			
MMW-19B-T01N-GRW	SA	567774		W	X	X		
MMW-19B-D01N-GRW	SA	567775		W	X			
MMW-3-T01N-GRW	SA	567776		W	X	X		
MMW-3-D01N-GRW	SA	567777		W	X			
MMW-2-T01N-GRW	SA	567778		W	X	X		
MMW-2-D01N-GRW	SA	567779		W	X			
MW-27-T01N-GRW	SA	567780		W	X	X		
MW-27-D01N-GRW	SA	567781		W	X			
MMW-30B-T01N-GRW	SA	567782	0BT01NGRW MW30BT01N	W	X	X	X	X
MMW-30B-D01N-GRW	SA	567783		W	X			
MMW-30B-T01D-GRW	FD	567784	30BT01DGRW MW30BT01DGRW	W			X	X
RB01T-GRW	RB	567785		W	X	X	X	X
RB01D-GRW	RB	567786		W	X			
RB02T-GRW	RB	567787		W	X	X		
RB02D-GRW	RB	567788		W	X			
FB01T-GRW	FB	567789		W			X	X
TB01T-GRW	TB	567790		W			X	

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate

FB = Field Blank TB = Trip Blank RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues not already addressed in the review table below, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

During the orthophosphate analysis of sample MMW-30B-T01N-GRW, the analyst observed that a cream color in the sample aliquot instead of the blue color normally observed. The laboratory suspects that this is due to the nature of the sample matrix. However, the orthophosphate result was qualified as estimated because it was greater than the total phosphorus result beyond the accuracy limits of the method and evaluation criteria.

The mercury analysis of the blank spike duplicate LCSDW0426C yielded no mercury recovery, indicating that this sample may not have been fortified with the spiking solution. The associated blank spike LCSW0426C exhibited an acceptable recovery, therefore, only this analysis was reported.

A volatile organic holding blank was carried through the sample storage period and analyzed with this case. The data for this blank has been included in the SDG and labeled HBW283C. All results for HBW283C were nondetect, as such, it is unlikely that any cross-contamination resulted from sample storage.

The nitroaromatics analysis of sample MMW-30B-T01N-GRW and MMW-30B-T01D-GRW yielded percent recoveries of the surrogate compound 1,2-Dinitrobenzene that exceeded control criteria on the CN column due to the presence of chromatographic peaks that interfered with the surrogate. 1,2-Dinitrobenzene exhibited acceptable recoveries on the LC-18 column. Since the results were reported from the LC-18 column, no qualifications of data were necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, sample MMW-42B-T01N-GRW for cyanide analysis was received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect result for this sample was qualified as estimated (UJ), with an indeterminate bias direction.
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken three days beyond log-in. The pH measurements were taken 6 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD MMW-30B-T01D-GRW (Organics only) PDS LD MMW-30B-T01D-GRW (Organics only)	Yes	The matrix spike recovery for 2,4,6-Trinitrotoluene exceeded the QC limits of 75-106% with a recovery of 110%. However, because the concentration in the parent sample was nondetect, no qualification was issued. The matrix spike duplicate recovery for RDX was slightly below the QC limits of 81-116% with a recovery of 80%. However, because the matrix spike recovery was within limits with a value of 92% and the matrix spike duplicate recovery was only slightly below the QC limits, no qualification was issued. The matrix quality control results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC Surrogates Serial Dilution (C) MMW-30A-T01N-GRW Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analysis on sample MMW-30A-T01N-GRW was applicable for 3 of the 24 metal analytes. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. All three applicable serial dilution results were within QC acceptance criteria. The serial dilution results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. Table 1.3 lists the total versus partial results outside acceptance criteria. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion except for RB01T/D-GRW and RB02T/D-GRW which yielded differences of 19.0% and 35.8%, respectively. No qualifications were applied because the high cation/anion differences are a result of the elevated reporting levels for metals. The ratios of the calculated versus measured TDS for all field samples were within the acceptance range of 0.5 and 1.5 except for RB01T/D-GRW and RB02T/D-GRW which yielded TDS ratios of 2.94 and 3.40, respectively. No qualifications were applied because the high TDS ratios are a result of the elevated reporting levels for metals.
Field QC Field Duplicate MMW-30B-T01D-GRW (Organics only) Rinsate Blank RB01T-GRW RB01D-GRW RB02T-GRW RB02D-GRW Field Blank FB01T-GRW Trip Blank TB01T-GRW	N/A	Table 1.4 lists the one field duplicate result outside QC acceptance limits. Table 1.5 lists the rinsate blank detections remaining after evaluating results for laboratory procedural blanks (i.e. method blanks and calibration blanks). The trip blank TB01T-GRW and field blank FB01T-GRW results were nondetect for all target analytes. The field QC results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.
Initial Calibration	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial/Continuing Calibration Verification	Yes	For selenium, the ICV percent recovery was 89.5%, slightly outside the QC acceptance range of 90-110%. Because 89.5 rounds to 90, no qualification was issued. The acetone concentration in samples MMW-30B-T01N-GRW and MMW-30B-T01D-GRW exceeded the upper limit of the calibration range. As such, these two samples were reanalyzed at a dilution and reported from this sequence.
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	Yes	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Orthophosphate (mg/L)	Cond. (µmhos/cm)	pH (std units)
MMW-30A-T01N-GRW	0.38 J	0.0050 UJ	0.010 UJ	2010 J	6.5 J
MMW-42B-T01N-GRW	0.20 UJ	---	---	2580 J	7.2 J
MMW-19B-T01N-GRW	0.20 UJ	---	0.010 UJ	2480 J	7.1 J
MMW-3-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	2130 J	7.2 J
MMW-2-T01N-GRW	0.20 UJ	0.0050 UJ	0.016 J	2380 J	6.4 J
MW-27-T01N-GRW	0.95 J	0.0050 UJ	0.020 J	353 J	7.9 J
MMW-30B-T01N-GRW	0.20 UJ	0.0051 J	0.066 J	2180 J	6.4 J
RB01T-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	0.000 UJ	7.4 J
RB02T-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	0.21 J	6.1 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Total Organic Carbon DF=1	U	1081	1106	U	U	1000	MMW-30A-T01N-GRW MMW-42B-T01N-GRW MMW-19B-T01N-GRW MMW-3-T01N-GRW MMW-2-T01N-GRW MW-27-T01N-GRW RB01T-GRW RB02T-GRW	U CCB-I
Aluminum DF=10	25.0	U	30.0	32.2	30.09	20.1	MMW-19B-T01N-GRW MMW-19B-D01N-GRW MMW-3-T01N-GRW MMW-3-D01N-GRW MMW-30B-D01N-GRW	U CCB,MB-I
Beryllium DF=1	U	-1.1	U	-0.8	-1.068	0.3	MMW-30A-T01N-GRW MMW-30A-D01N-GRW MMW-42B-T01N-GRW MMW-42B-D01N-GRW MMW-19B-T01N-GRW MMW-19B-D01N-GRW MMW-3-T01N-GRW MMW-3-D01N-GRW MW-27-T01N-GRW MW-27-D01N-GRW MMW-30B-T01N-GRW MMW-30B-D01N-GRW RB01T-GRW RB01D-GRW RB02T-GRW RB02D-GRW	UJ CCB,MB-I or J CCB,MB-I
Cadmium DF=1	U	U	U	-0.4	U	0.3	RB02T-GRW RB02D-GRW	UJ CCB-L
Chromium DF=1	U	U	U	-0.7	U	0.6	RB02T-GRW RB02D-GRW	UJ CCB-L
Nickel DF=1	U	U	U	U	-2.081	1.5	MMW-42B-T01N-GRW MMW-42B-D01N-GRW MW-27-T01N-GRW MW-27-D01N-GRW MMW-30B-T01N-GRW MMW-30B-D01N-GRW RB01T-GRW RB01D-GRW RB02T-GRW RB02D-GRW	UJ MB-L
Silver DF=2	-0.2	-0.2	-0.2	-0.2	-0.16	0.1	All samples in this data package	UJ CCB,MB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Sodium DF=10	U	673.0	383.1	U	715.9	327.5	MMW-30A-T01N-GRW MMW-30A-D01N-GRW MW-27-T01N-GRW RB01T-GRW RB02D-GRW	U CCB,MB-I

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit U=Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications

Sample	Analyte	Dissolved (µg/L)	Total (µg/L)	Adjusted RL (µg/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
MMW-30B-T01N-GRW	Orthophosphate	---	66	10	Diff. > 2xRL	2.6xRL	J TvP-I
	Phosphorous	---	40	10			J TvP-I
MMW-30B-T/D01N-GRW	Cadmium	6.9	3.1	0.3	Diff. > 30%	76%	J TvP-I
	Copper	49.1	34.3	1.4	Diff. > 30%	35%	J TvP-I
	Nickel	122	53.0	1.5	Diff. > 30%	79%	J TvP-I
	Zinc	621	289	24	Diff. > 30%	73%	J TvP-I

Table 1.4
Field Duplicate Qualifications

Sample	Analyte	Parent Concentration (µg/L)	Duplicate Concentration (µg/L)	RL (µg/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
MMW-30B-T01N/T01D-GRW	PETN	50	28	10	Diff. > 2xRL	2.2xRL	J FD-I

Table 1.5
Rinsate Blank Detections

Analyte	RL (ug/L)	Concentration (ug/L)
RB01T-GRW		
Total Dissolved Solids	5000	8000
Chloride	200	380
Bicarbonate Alkalinity	1000	3200
Total Alkalinity	1000	3200
RB02T-GRW		
Total Dissolved Solids	5000	7000
Bicarbonate Alkalinity	1000	2600
Total Alkalinity	1000	2600
Copper	1.4	1.5

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT284A Sampling Event: April 2004 GRW and SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Brian Olmsted Date Completed: 05-26-04

Peer Reviewer: Stacey Coker Date Completed: 06-02-04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses				
					Metals	Inorganics	VOCs	PAH	TPH
MMW-42A-T01N-GRW	SA	567835		W	X	X			
MMW-42A-D01N-GRW	SA	567836		W	X				
MMW-47A-T01N-GRW	SA	567837		W	X	X			
MMW-47A-D01N-GRW	SA	567838		W	X				
MMW-19A-T01N-GRW	SA	567839		W	X	X			
MMW-19A-D01N-GRW	SA	567840		W	X				
MMW-21-T01N-GRW	SA	567841		W	X	X			
MMW-21-D01N-GRW	SA	567842		W	X				
MMW-21-T01D-GRW	FD	567843		W	X	X			
MMW-21-D01D-GRW	FD	567844		W	X				
MMW-45B-T01N-GRW	SA	567845		W	X	X			
MMW-45B-D01N-GRW	SA	567846		W	X				
MMW-45A-T01N-GRW	SA	567847		W	X	X			
MMW-45A-D01N-GRW	SA	567848		W	X				
MMW-48A-T01N-GRW	SA	567849	8AT01NGRW MW48AT01N T01N-GRW	W	X	X	X	X	X
MMW-48A-D01N-GRW	RB	567850		W	X				
MMW-48A-T01D-GRW	FD	567851	MW8AT01DGRW MMW48AT01DGR T01D-GRW	W	X	X	X	X	X
MMW-48A-D01D-GRW	FD	567852		W	X				
FB02T-GRW	FB	567853		W			X	X	X
RB02T-GRW	RB	567854		W			X	X	X
TB02T-GRW	TB	567855		W			X		

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate FB = Field Blank
TB = Trip Blank RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues mentioned in the case narrative have been addressed in the review table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The VOC analysis was inadvertently not checked on the COC for MMW-48A-T01N-GRW. The analysis was logged in per the client's request.
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken three days beyond log-in. The pH measurements were taken 6 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various analytes were detected in the preparation blanks and continuing calibration blanks. Table 1.2a and 1.2b summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD MMW-48A-T01N-GRWS MMW-48A-D01N-GRWS PDS MMW-48A-T01N-GRWA MMW-48A-D01N-GRWA LD MMW-48A-T01N-GRWD MMW-48A-D01N-GRWD	No	Table 1.3 lists the matrix spike results outside QC limits. The matrix quality control results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (C) MMW-48A-T01N-GRWL MMW-48A-D01N-GRWL Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The volatile organic analysis and reanalysis of sample FB02T-GRW yielded percent recoveries of the surrogate monitoring compound Toluene-d8 that were slightly below the QC acceptance limits of 88-110% with recoveries of 87% and 86%, respectively. No qualification was issued because of the small exceedances and because the other three surrogates were within acceptance limits. The serial dilution analyses on the matrix spike of samples MMW-48A-T01N-GRW and MMW-48A-D01N-GRW were applicable for 5 of the 24 metal analytes. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. All five applicable serial dilution results for each sample were within QC acceptance criteria. The serial dilution results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within the acceptance range of 0.5 and 1.5.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC Field Duplicate MMW-21A-T01D-GRW MMW-21A-D01D-GRW MMW-48A-T01D-GRW MMW-48A-D01D-GRW Rinsate Blank RB02T-GRW RB02D-GRW Field Blank FB02T-GRW Trip Blank TB02T-GRW	N/A	Table 1.4 lists the one field duplicate result outside QC acceptance limits. Table 1.5 lists the rinsate, field and trip blank detections found. Methyl chloride was detected in all three blanks but was not detected in the two field samples. The field QC results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.
Initial Calibration	No	Tables 1.6 summarizes the initial calibration results that were outside the evaluation criteria and the resulting qualifications.
Initial/Continuing Calibration Verification	No	During the chloride analyses performed on 5/3/04, some calibration verification standards exhibited percent recoveries that slightly exceeded the upper control limits of 90-110%. The recoveries for CCV1 was 108%, CCV2 was 114%, CCV3 was 115% and CCV4 was 116%. The field samples analyzed for this data package were analyzed between CCV1 and CCV3. All chloride results were qualified as estimated with a high bias (J CCV-H). Tables 1.7 summarizes the VOCs continuing calibration results that were outside the evaluation criteria and the resulting qualifications.
Laboratory Control Sample Results	No	Table 1.8 lists the LCS results outside QC acceptance limits that required qualification.
Compound Identification	Yes	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	Yes	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Orthophosphate (mg/L)	Cond. (µmhos/cm)	pH (std units)
MMW-42A-T01N-GRW	---	---	---	2220 J	5.0 J
MMW-47A-T01N-GRW	1.00 J	0.0050 UJ	0.010 UJ	665 J	5.1 J
MMW-19A-T01N-GRW	---	---	---	1640 J	4.5 J
MMW-21-T01N-GRW	---	---	---	3310 J	3.2 J
MMW-21-T01D-GRW	---	---	---	3360 J	3.1 J
MMW-45B-T01N-GRW	0.20 UJ	---	0.061 J	2210 J	4.0 J
MMW-45A-T01N-GRW	0.38 J	0.0050 UJ	0.010 UJ	1320 J	4.1 J
MMW-48A-T01N-GRW	0.20 UJ	0.0050 UJ	0.077 J	3010 J	5.4 J
MMW-48A-T01D-GRW	0.20 UJ	0.0050 UJ	0.082 J	3040 J	5.4 J

Table 1.2a
Volatile and Semivolatile Blank Detections Resulting in Data Qualification

Blank	Date	Analyte	Concentration (µg/L)	Samples Qualified	Qualification and Qualification Codes
VBLKE6	4/21/04	Naphthalene	0.28 J	MMW-48A-T01D-GRW	U MB-I

For brevity, the table was limited to blank detections that resulted in data qualification

Table 1.2b
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Aluminum DF=100	27.7	27.1	22.7	38.8	U	17.6	MMW-47A-T01N-GRW MMW-47A-D01N-GRW	U CCB-I
Boron DF=10	2.5	U	U	U	U	1.8	MMW-42A-T01N-GRW MMW-19A-T01N-GRW MMW-21-T01N-GRW MMW-21-D01N-GRW	U CCB-I
Cadmium DF=100	U	U	0.4	U	U	0.3	MMW-21-T01D-GRW MMW-21-D01D-GRW MMW-45B-T01N-GRW MMW-45B-D01N-GRW MMW-45A-T01N-GRW MMW-45A-D01N-GRW	U CCB-I
Cobalt DF=100	U	U	U	1.2	U	1.1	MMW-48A-D01N-GRW MMW-48A-T01D-GRW MMW-48A-D01D-GRW	U CCB-I
Copper DF=100	U	0.9	1.0	1.3	1.257	0.7	MMW-47A-T01N-GRW MMW-47A-D01N-GRW MMW-48A-T01N-GRW MMW-48A-D01D-GRW	U CCB,MB-I
Iron DF=100	24.4	U	20.5	24.2	U	19.2	MMW-42A-T01N-GRW MMW-42A-D01N-GRW MMW-19A-D01N-GRW	U CCB-I
Molybdenum DF=10	U	1.0	U	U	1.845	1.0	MMW-42A-T01N-GRW MMW-47A-T01N-GRW	U CCB,MB-I
Potassium DF=100	U	-261.0	-233.0	109.6	U	109.3	All samples in this data package	UJ CCB-L or UJ CCB-I
Silver DF=10	-0.3	-0.3	-0.3	-0.3	-0.2739	0.1	All samples in this data package	UJ CCB,MB-L
Sodium DF=10	U	216.2	U	257.5	285.7	172.6	All samples in this data package	U CCB,MB-I

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit U=Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results And Parent Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Comment	Action
MMW-48A-T01N-GRW					
Total Alkalinity	74%	NA	75-125%	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery	No Qualification
Total Organic Carbon	0%	NA		Matrix spike result was analyzed with a five-fold dilution and found to be nondetect. A recovery of 28.9% is calculated if RL value is used instead of zero.	J MS-L for parent sample and it's field duplicate
Copper	71.3%	107.1%		Based on continuing calibration blank and method blank both the spiked result and sample result are qualified as nondetect. Therefore the difference between the spike level and the RL is < 1xRL.	No Qualification
2-Chloroethyl Vinyl Ether	0% and 0%	NA	60-140%	None	R MS-L
1,2-Dibromoethane	89% and 91%	NA	90-114%	Average within QC limits.	No Qualification
Xylene (m,p)	74% and 74%	NA	78-116%	None	UJ MS-L for parent sample and its field duplicate.
Xylene (o)	75% and 75%	NA	81-125%	None	UJ MS-L for parent sample and it's field duplicate.
Styrene	46% and 45%	NA	80-124%	None	UJ MS-L for parent sample and it's field duplicate.
Bromoform	66% and 68%	NA	82-120%	None	UJ MS-L for parent sample and it's field duplicate.
1,3,5-Trimethylbenzene	65% and 63%	NA	72-112%	None	UJ MS-L for parent sample and it's field duplicate.
MMW-48A-D01N-GRW					
Arsenic	58.0%	110.5%	75-125%	None	UJ MS-L for parent sample and it's field duplicate.

NA = Not appropriate ND = Nondetect RL = Reporting limit (generally the IDL adjusted for dilution) IDL = Instrument detection limit

Table 1.4
Field Duplicate Qualifications

Sample	Analyte	Parent Concentration (mg/L)	Duplicate Concentration (mg/L)	RL (mg/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
MMW-48A-T01N/T01D-GRW	Total Suspended Solids	16.3	22.9	0.50	RPD > 30%	34%	J FD-I

Table 1.5
Blank Detections for Organic Field QC Blanks

Analyte	RL (ug/L)	Concentration (ug/L)
FB02T-GRW		
Methyl Chloride	1.0	0.59 J
RB02T-GRW		
Methyl Chloride	1.0	0.55 J
TB02T-GRW		
Methyl Chloride	1.0	0.36 J

Table 1.6
Initial Calibration Results Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	ICAL Date/Time	Analyte	% RSD >30%	Samples Qualified	Qualification and Qualification Codes
VOC	03/24/04 (0721)	Chloroethane	30.9%	MMW-48A-T01N-GRW MMW-48A-T01D-GRW FB02T-GRW RB02T-GRW TB02T-GRW	UJ ICAL-I
		2-Hexanone	47.4%		

ICAL = Initial Calibration RSD = Percent relative standard deviation

Table 1.7
Continuing Calibration Results Not Meeting Acceptance Criteria and Data Qualification

Organic Analysis	CCAL Date/Time	Analyte	% RSD >25%	Samples Qualified	Qualification Codes
VOC	03/24/04 (0721)	Chloroethane	29.7%	MMW-48A-T01N-GRW MMW-48A-T01D-GRW FB02T-GRW RB02T-GRW TB02T-GRW	UJ CCAL-I
		Acrolein	37.5%		
		Acetone	46.2%		
		Vinyl Acetate	25.5%		
		2-Butanone	33.3%		
		Propionitrile	27.3%		
		Tetrahydrofuran	37.9%		
		Isobutyl Alcohol	33.3%		
		1,4-Dioxane	33.3%		
		2-Hexanone	27.1%		

CCAL = Continuing Calibration RSD = Percent relative standard deviation

Table 1.8
LCS Results Not Meeting Acceptance Criteria

Analyte	LCS and LCSD %R	Criteria	Comment	Action
1,2-Dibromoethane	85% and 93%	90-114%	Average recovery (89%) slightly outside QC limits.	UJ LCS-L
Bromoform	78% and 84%	82-120%	Average recovery (81%) slightly outside QC limits.	UJ LCS-L

NA = Not appropriate ND = Nondetect

RL = Reporting limit (generally the IDL adjusted for dilution)

IDL = Instrument detection limit

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT285S Sampling Event: April 2004 GRW and SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 05-27-04

Peer Reviewer: Stacey Coker Date Completed: 06-01-04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics[3]
RR-11A1-T01N-SFW	SA	567961		W	X	X
RR-11A1-D01N-SFW	SA	567962		W	X	
RR-11C-T01N-SFW	SA	567963		W	X	X
RR-11C-D01N-SFW	SA	567964		W	X	
RR-7-T01N-SFW	SA	567965		W	X	X
RR-7-D01N-SFW	SA	567966		W	X	
RR-10-T01N-SFW	SA	567967		W	X	X
RR-10-D01N-SFW	SA	567968		W	X	
RR-10A1-T01N-SFW	SA	567969		W	X	X
RR-10A1-D01N-SFW	SA	567970		W	X	
RR-16-T01N-SFW	SA	567971		W	X	X
RR-16-D01N-SFW	SA	567972		W	X	
RR-14-T01N-SFW	SA	567973		W	X	X
RR-14-D01N-SFW	SA	567974		W	X	
RR-13-T01N-SFW	SA	567975		W	X	X
RR-13-D01N-SFW	SA	567976		W	X	
RR-12-T01N-SFW	SA	567977		W	X	X
RR-12-D01N-SFW	SA	567978		W	X	

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

[3] BOD and COD are included in the inorganic suite for surface water samples.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues mentioned in the case narrative are addressed in the review table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The BOD analysis was not checked on the COC for all samples in this data package. The samples were logged in for these analyses in per the client's request.
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken two days beyond log-in. The pH measurements were taken 7 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various analytes were detected in the preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD PDS LD	N/A	The matrix quality control results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (C) RR-11A1-T01N-SFW Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analysis performed on sample RR-11A1-T01N-SFW was applicable for 3 of the 24 metal analytes. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. All three applicable serial dilution results were within QC acceptance criteria. The serial dilution results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. Table 1.3 lists the total versus partial results outside acceptance criteria. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within the acceptance range of 0.5 and 1.5.
Field QC Field Duplicate Rinsate Blank Field Blank Trip Blank	N/A	The field QC results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	BOD (mg/L)	TSS (mg/L)	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Orthophosphate (mg/L)	Cond. (µmhos/cm)	pH (std units)
RR-11A1-T01N-SFW	---	---	0.34 J	---	---	181 J	8.0 J
RR-11C-T01N-SFW	1.3 UJ	---	0.35 J	0.0050 UJ	0.010 UJ	202 J	7.7 J
RR-7-T01N-SFW	---	---	---	---	---	192 J	7.9 J
RR-10-T01N-SFW	---	---	0.38 J	---	---	191 J	7.6 J
RR-10A1-T01N-SFW	---	---	0.36 J	---	---	209 J	7.7 J
RR-16-T01N-SFW	1.3 UJ	23.3 J	0.37 J	0.0050 UJ	0.010 UJ	189 J	8.0 J
RR-14-T01N-SFW	1.3 UJ	33.5 J	0.36 J	0.0050 UJ	0.010 UJ	207 J	7.6 J
RR-13-T01N-SFW	1.3 UJ	29.5 J	0.36 J	0.0050 UJ	0.010 UJ	201 J	7.7 J
RR-12-T01N-SFW	1.3 UJ	26.3 J	0.36 J	0.0050 UJ	0.010 UJ	204 J	7.9 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS) DF=1	0.5	0.5	0.6	0.6	0.475	0.4	All samples in this data package	U CCB,MB-I
Beryllium (P) DF=1	U	U	U	-0.2	U	0.2	RR-12-T01N-SFW RR-12-D01N-SFW	UJ CCB-L
Cobalt (P) DF=1	U	U	U	-1.8	U	1.1	RR-12-T01N-SFW RR-12-D01N-SFW	UJ CCB-L
Chromium (P) DF=1	-1.9	-1.6	-1.7	-3.3	-1.838	0.8	All samples in this data package	UJ CCB,MB-L
Iron (P) DF=1	U	U	U	-40.5	U	19.2	RR-12-D01N-SFW	J CCB-L
Lead (MS) DF=1	U	U	U	U	1.251	0.4	All samples in this data package	U MB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Molybdenum (MS) DF=1	1.3	1.2	1.3	1.3	1.269	0.3	All samples in this data package	U CCB,MB-I
Potassium (P) DF=1	362.7	343.2	U	U	230.6	109.3	RR-11A1-T01N-SFW RR-11A1-D01N-SFW RR-11C-T01N-SFW RR-11C-D01N-SFW RR-7-T01N-SFW RR-7-D01N-SFW RR-10-T01N-SFW RR-10-D01N-SFW RR-10A1-D01N-SFW RR-16-T01N-SFW RR-16-D01N-SFW RR-14-T01N-SFW RR-14-D01N-SFW RR-13-T01N-SFW RR-13-D01N-SFW RR-12-T01N-SFW RR-12-D01N-SFW	U CCB-I or U CCB,MB-I or U MB-I
Silver (MS) DF=1	-0.2	-0.2	-0.2	-0.2	-0.225	0.1	All samples in this data package	UJ CCB,MB-L
Thallium (MS) DF=1	0.1	0.1	0.1	0.1	0.118	0.1	All samples in this data package	U CCB,MB-I

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit U=Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Qualifications

Sample	Analyte	Dissolved (µg/L)	Total (µg/L)	Adjusted RL (µg/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
RR-14-T01N/D01N-SFW	Cobalt	5.8	1.7	1.1	Diff. > 2xRL	3.7xRL	J TvP-I
RR-13-T01N/D01N-SFW	Cobalt	4.0	1.6	1.1	Diff. > 2xRL	2.2xRL	

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT285SA Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 06/04/04

Peer Reviewer: Stacey Coker Date Completed: 06/04/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses				
				Metals	Inorganics	BOD	pH	Conductivity
CAPULIN1-T01N-SFW	SA	568223A	W	X	X	X	X	X
CAPULIN1-D01N-SFW	SA	568224A	W	X				

Matrix: W = Water QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative noted that this sample delivery group (SDG) contains the analysis of sample CAPULIN1 as a class "A" groundwater sample, due to its low pH. Accordingly, the metals analyses were performed at the dilution levels established by the client and the laboratory.

The laboratory case narrative noted that the original fluoride analysis for sample CAPULIN1-T01N-SFW was accomplished within the prescribed analytical holding time of 28 days at a straight analysis. However, due to the elevated aluminum levels in this sample, it was necessary to dilute and re-analyze this sample for fluoride. The reported fluoride analysis was analyzed 8 days outside of holding time. Accordingly, the fluoride result for this sample was qualified as estimated (J) with an indeterminate bias direction assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The BOD_5 sample result for sample CAPULIN1-T01N-SFW was qualified as estimated (UJ), as the 48 hour holding time was exceeded by less than 2x the prescribed analytical holding time. As mentioned in the case narrative section, the fluoride result for CAPULIN1-T01N-SFW was qualified as estimated (J). The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 9 days after sampling and 7 days beyond log-in. The pH for the same samples were measured several hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD PDS LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (C) CAPULIN1-T01N-SFW Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analysis run on sample CAPULUN1-T01N-SFW was applicable for only one (manganese) of the 24 analytes. The remaining analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent difference (between initial and serial dilution results) for manganese was reviewed and accordingly did not result in qualification, as it was below 10%. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances.
Field QC Field Duplicate Rinsate Blank Field Blank Trip Blank	N/A	This SDG did not include the analysis of field QC samples. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Fluoride (mg/L)	BOD_5 (mg/L)	Cond. (µmhos/cm)	pH (std units)
CAPULIN1-T01N-SFW	12.7 J	1.3 UJ	1410 J	3.9 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Arsenic (P)	-3.2	---	-32.78	2.6	CAPULIN1-T01N-SFW CAPULIN1-D01N-SFW	UJ MB,CCB-L
Cobalt (P)	1.4	---	---	1.1		U CCB-I
Copper (P)	2.6	1.3	---	0.7		
Iron (P)	53.8	37.2	---	19.2		
Silver (MS)	-0.1	-0.1	-1.315	0.10		UJ MB,CCB-L
Potassium (P)	-1451.1	-748.8	-46260	109.3		
Sodium (P)	---	-480.6	---	172.6		J CCB-L UJ CCB-L

P= ICP MS = Mass Spectroscopy CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT286A Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 05/26/04

Peer Reviewer: Stacey Coker Date Completed: 06/03/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
SC-3B-T01N-GRW	SA	568020	W	X	X
SC-3B-D01N-GRW	SA	568021	W	X	
MMW-34B-T01N-GRW	SA	568022	W	X	X
MMW-34B-D01N-GRW	SA	568023	W	X	
MMW-38A-T01N-GRW	SA	568024	W	X	X
MMW-38A-D01N-GRW	SA	568025	W	X	
MMW-7-T01N-GRW	SA	568026	W	X	X
MMW-7-D01N-GRW	SA	568027	W	X	
MMW-22-T01N-GRW	SA	568028	W	X	X
MMW-22-D01N-GRW	SA	568029	W	X	
SC-4A-T01N-GRW	SA	568030	W	X	X
SC-4A-D01N-GRW	SA	568031	W	X	
SC-3A-T01N-GRW	SA	568032	W	X	X
SC-3A-D01N-GRW	SA	568033	W	X	
SC-1A-T01N-GRW	SA	568034	W	X	X
SC-1A-D01N-GRW	SA	568035	W	X	

Matrix: W = Water QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative noted that during the chloride analysis from 05/03/04, some of the calibration verification standards exhibited percent recoveries that slightly exceeded the upper control limit. Upon review of the raw ion chromatography data., it was verified that CCV2 and CCV3 reported recoveries of 113% and 115%, respectively. Three of the samples in this data delivery group were analyzed for chloride in the run sequence. All detected chloride results for these samples (MMW-38A-

T01N-GRW, MMW-7-T01N-GRW, and MMW-22-T01N-GRW) were qualified as estimated (J) with a qualifier code of "CCV" and potential high bias direction assigned.

The laboratory case narrative noted during the cyanide analysis designated 040430B, the initial calibration verification analysis exhibited a percent difference in excess of the upper control limit. As cyanide was not detected in any of the associated field samples, a potential high bias resulting from an elevated calibration verification would not affect the quality or usability of the data. Therefore, none of the cyanide results were qualified as a result of this finding.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, samples MMW-34B-T01N-GRW, MMW-7-T01N-GRW, and MMW-7-D01N-GRW, for the analysis of metals, was received with a pH greater than 2 and subsequently required the addition of HNO_3^- to attain the proper pH for preservation. No qualification was necessary for the metal results for these three samples, due to the fact that the nitric acid added would have dissolved most of the metals that might have precipitated out. This was further supported by the observation that the diluted metal concentrations are comparable to the total metal concentrations.
Holding Times	No	The majority of the sample results for nitrate, nitrite, and orthophosphate were qualified as estimated (J/UJ), as the samples were analyzed in excess of 48 hours, but less than 2x the prescribed analytical holding time. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken four days after sampling and two days beyond log-in. The pH for the same samples were measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD PDS LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (A) SC-3B-T01N-GRWL Total vs. Partial Analyses Cation/Anion Balance Internal Standards	Yes	The serial dilution analysis run on sample SC-3B-T01N-GRW was applicable for only one (manganese) analyte of the 24 analytes. The remaining 23 analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution or nondetect. The percent difference (between initial and serial dilution results) for manganese was less than 10%, and therefore did not result in qualification. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion, with the exception of sample SC-1A-*01N-GRW, which reported a cation/anion balance of 13.11%. This balance was verified independently. No qualification was determined to be necessary due to the fact that the percentage was only marginally in excess of the control criterion.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances
Field QC Field Duplicate Rinsate Blank	N/A	This SDG did not include the analysis of Field QC samples. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
SC-3B-T01N-GRW	0.20 UJ	---	---	2400 J	6.0 J
MMW-34B-T01N-GRW	2.2 J	---	---	2530 J	5.0 J
MMW-38A-T01N-GRW	0.35 J	0.0098 J	0.010 UJ	6190 J	3.9 J
MMW-7-T01N-GRW	0.20 UJ	0.0050 UJ	16.9 J	5810 J	4.5 J
MMW-22-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	3090 J	3.9 J
SC-4A-T01N-GRW	0.27 J	---	---	2050 J	3.7 J
SC-3A-T-1N-GRW	0.28 J	0.0050 UJ	0.010 UJ	2010 J	3.8 J
SC-1A-T01N-GRW	0.20 UJ	0.0050 UJ	0.045 J	2430 J	4.1 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (MS)	---	---	---	8.1	53.22	5.3	SC-1A-T01N-GRW	U MB-I
Arsenic (MS)	---	---	---	4.1	38.32	3.7	MMW-34B-D01N-GRW MMW-38A-D01N-GRW MMW-7-D01N-GRW MMW-7-T01N-GRW SC-3A-D01N-GRW SC-3B-D01N-GRW SC-3B-T01N-GRW SC-4A-T01N-GRW	U MB-I
Beryllium (MS)	-0.3	-0.4	-0.6	-0.8	---	0.3	SC-1A-D01N-GRW SC-1A-T01N-GRW SC-3A-D01N-GRW SC-3A-T01N-GRW SC-4A-D01N-GRW SC-4A-T01N-GRW	J CCB-L
Boron (MS)	5.3	---	5.5	5.2	49.06	3.6	MMW-22-D01N-GRW MMW-34B-D01N-GRW MMW-34B-T01N-GRW MMW-38A-D01N-GRW MMW-38A-T01N-GRW MMW-7-D01N-GRW SC-1A-D01N-GRW SC-3A-D01N-GRW SC-3A-T01N-GRW SC-3B-D01N-GRW SC-3B-T01N-GRW SC-4A-D01N-GRW SC-4A-T01N-GRW	U MB,CCB-I
Chromium (P)	---	---	1.6	---	---	1.3	MMW-7-T01N-GRW	U CCB-I
Copper (P)	---	---	5.3	---	---	2.7	MMW-22-D01N-GRW MMW-22-T01N-GRW MMW-7-D01N-GRW MMW-7-T01N-GRW SC-1A-D01N-GRW SC-1A-T01N-GRW SC-3A-D01N-GRW SC-3A-T01N-GRW SC-4A-D01N-GRW SC-4A-T01N-GRW	U CCB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Iron (P)	---	---	---	---	-3662.00	29.3	MMW-34B-D01N-GRW MMW-34B-T01N-GRW MMW-38A-D01N-GRW MMW-38A-T01N-GRW SC-3A-D01N-GRW SC-3A-T01N-GRW SC-4A-D01N-GRW SC-4A-T01N-GRW	J MB-L UJ MB-L
Nickel (P)	---	---	---	---	-697.0	3.3	MMW-22-D01N-GRW MMW-22-T01N-GRW MMW-34B-D01N-GRW MMW-34B-T01N-GRW SC-1A-D01N-GRW SC-1A-T01N-GRW SC-3A-D01N-GRW SC-3A-T01N-GRW SC-3B-D01N-GRW SC-3B-T01N-GRW SC-4A-D01N-GRW SC-4A-T01N-GRW	J MB-L UJ MB-L
Silver (MS)	-0.3	-0.3	-0.3	-0.3	-2.739	0.10	All samples results were qualified	UJ MB,CCB-L
Sodium (P)	339.3	---	---	---	---	3.27	MMW-34B-T01N-GRW MMW-38A-D01N-GRW MMW-38A-T01N-GRW SC-3B-D01N-GRW SC-3B-T01N-GRW	U CCB-I

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT287C Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 06/01/04

Peer Reviewer: Stacey Coker Date Completed: 06/03/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
MMW-8A-T01N-GRW	SA	568089	W	X	X
MMW-8A-D01N-GRW	SA	568090	W	X	
MMW-4A-T01N-GRW	SA	568091	W	X	X
MMW-40A-D01N-GRW	SA	568092	W	X	
SC-2B-T01N-GRW	SA	568093	W	X	X
SC-2B-D01N-GRW	SA	568094	W	X	
SC-1B-T01N-GRW	SA	568095	W	X	X
SC-1B-D01N-GRW	SA	568096	W	X	
MMW-8B-T01N-GRW	SA	568097	W	X	X
MMW-8B-D01N-GRW	SA	568098	W	X	
MMW-35B-T01N-GRW	SA	568099	W	X	X
MMW-35B-D01N-GRW	SA	568100	W	X	
MMW-23B-T01N-GRW	SA	568215	W	X	X
MMW-23B-D01N-GRW	SA	568216	W	X	
SC-5B-T01N-GRW	SA	568217	W	X	X
SC-5B-D01N-GRW	SA	568218	W	X	
MMW-18B-T01N-GRW	SA	568219	W	X	X
MMW-18B-D01N-GRW	SA	568220	W	X	
PR3-T01N-GRW	SA	568221	W	X	X
PR3-D01N-GRW	SA	568222	W	X	

Matrix: W = Water QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative noted that during the chloride analysis from 05/03/04, several calibration verification analyses exhibited percent recoveries that slightly exceeded the upper control limit. Upon

review of the raw data, it was verified that continuing calibration verifications (CCV) #2,3, and 4 were in excess of 110%, with a range of 113-116%. All chloride sample results associated with these calibration verifications were qualified as estimated (J) with a potential high bias assigned.

The laboratory case narrative noted that during the cyanide analysis, designated 040430B, the initial calibration verification (ICV) exhibited a percent difference in excess of the upper control limit. As all of the cyanide results were nondetect, the potential of a high bias on the basis of an elevated ICV did not result in qualification of data results.

As noted in the laboratory case narrative, the metals analysis of the dissolved metals sample MMW-18B-D01N-GRW yielded a manganese concentration that was approximately twice the concentration of manganese reported for the total fraction of this sample. These results were confirmed by multiple acquisitions on the trace ICP as well as on the ICP/MS using a separate digestate. As the criteria for Total vs. Partial comparisons was not met for manganese for this sample, both manganese results were qualified as estimated (J) with an indeterminate bias direction assigned.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The majority of sample results for nitrate, nitrite, and orthophoshpate were qualified as estimated (J/UJ). Samples were analyzed in excess of 48 hours, but less than 2x the prescribed analytical holding time. Accordingly, it was not necessary to consider rejecting nondetect results. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken four-eight days after sampling and two-six days beyond log-in. The pH for the same samples were measured approximately seven hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD PDS LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (C) MMW-8A-T01N-GRW Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analysis run on sample MMW-8A-T01N-GRW was applicable for only four of the 24 analytes. The remaining 17 analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. As none of the %Ds for the four applicable analytes were greater than 10%, no qualification of data results was necessary on the basis of serial dilution results. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. As noted in the laboratory case narrative, sample results for manganese in samples MMW-18B-D01N-GRW and MMW-18B-T01N-GRW were qualified as estimated on the basis of total vs partial imbalance. Sample results for several other analytes in other samples were qualified as estimated with an indeterminate bias direction, as

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		summarized in Table 1.3. Two results for orthophosphate and phosphorus were qualified as estimated on the basis of total versus partial disagreement. Table 1.3 summarizes the results qualified along with the concentrations reported. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances
Field QC Field Duplicate Rinsate Blank	N/A	This SDG did not include the analysis of Field QC samples. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
MMW-8A-T01M-GRW	---	---	---	2840 J	7.1 J
MMW-40A-T01N-GRW	3.0 J	0.0050 UJ	0.040 J	2080 J	5.8 J
SC-2B-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	2740 J	6.6 J
SC-1B-T01N-GRW	0.20 UJ	0.0050 UJ	0.071 J	2200 J	7.0 J
MMW-8B-T01N-GRW	---	---	---	929 J	6.9 J
MMW-35B-T01N-GRW	0.20 UJ	---	---	2080 J	6.8 J
MMW-23B-T01N-GRW	0.20 UJ	---	---	645 J	8.0 J
SC-5B-T01N-GRW	0.20 UJ	0.0050 UJ	0.58 J	2130 J	7.2 J
MMW-18B-T01N-GRW	0.86 J	0.0050 UJ	0.010 UJ	2530 J	6.8 J
PR3-T01N-GRW	---	---	---	356 J	6.8 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum (P)	24.2	28.7	29.0	---	528.2	17.6	MMW-18B-D01N-GRW MMW-18B-T01N-GRW MMW-23B-D01N-GRW MMW-23B-T01N-GRW MMW-40A-D01N-GRW MMW-40A-T01N-GRW MMW-8A-D01N-GRW MMW-8A-T01N-GRW PR3-D01N-GRW SC-5B-D01N-GRW	U MB,CCB-I
Boron (P)	2.2	2.2	3.7	3.3	2.542	1.8	MMW-40A-D01N-GRW MMW-40A-T01N-GRW PR3-D01N-GRW PR3-T01N-GRW SC-1B-D01N-GRW SC-1B-T01N-GRW SC-2B-T01N-GRW	U MB,CCB-I U MB-I
Cobalt (P)	---	---	---	1.4	---	1.1	PR3-D01N-GRW	U CCB-I
Copper (P)	---	---	-1.7	---	---	0.7	MMW-18B-D01N-GRW MMW-23B-D01N-GRW MMW-23B-T01N-GRW MMW-35B-D01N-GRW MMW-8B-D01N-GRW MMW-8B-T01N-GRW SC-1B-D01N-GRW SC-1B-T01N-GRW CS-5B-D01N-GRW SC-5B-T01N-GRW	J CCB-L UJ CCB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Iron (P)	34.1	59.5	39.0	---	256.8	19.2	MMW-18B-D01N-GRW MMW-18B-T01N-GRW MMW-23B-D01N-GRW MMW-23B-T01N-GRW MMW-40A-D01N-GRW MMW-40A-T01N-GRW MMW-8B-D01N-GRW MMW-8B-T01N-GRW PR3-D01N-GRW SC-1B-D01N-GRW SC-1B-T01N-GRW SC-2B-D01N-GRW SC-2B-T01N-GRW SC-5B-D01N-GRW SC-5B-T01N-GRW	U MB,CCB-I U CCB-I
Nickel (P)	1.7	---	---	---	-2.078	1.5	MMW-23B-D01N-GRW MMW-23B-T01N-GRW MMW-8A-D01N-GRW MMW-8A-T01N-GRW PR3-D01N-GRW PR3-T01N-GRW SC-1B-D01N-GRW SC-1B-T01N-GRW SC-5B-D01N-GRW SC-5B-T01N-GRW	UJ MB-L
Potassium (P)	---	460.3	252.1	291.5	178.4	109.3	MMW-23B-D01N-GRW MMW-23B-T01N-GRW PR3-T01N-GRW	U CCB-I
Silver (MS)	-0.3	-0.3	-0.3	-0.3	-0.672	0.0.10	All samples results were qualified	UJ MB,CCB-L
Sodium (P)	226.7	-298.0	243.6	-283.6	---	172.6	PR3-D01N-GRW PR3-T01N-GRW	U CCB-I

MS = Mass Spect = ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total vs. Partial Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Total Fraction (µgL)	Dissolved Fraction (µg/L)	RL (µg/L)	Criteria	Qualification Codes
SC-5B-T01N-GRW	Total P/Ortho-P	0.028(mg/L)	0.58 (mg/L)	0.010 (mg/L)	|Diff| <2xRL	J TvP-I
MMW-18B-T01N-GRW MMW-18B-D01N-GRW	Manganese	881	1600	19.0	D 30%>T	J TvP-I
MMW-40A-T01N-GRW MMW-40A-D01N-GRW	Cobalt	1.1 U	4.4	1.1	|Diff| <2xRL	J/UJ TvP-I
MMW-8B-T01N-GRW MMW-8B-D01N-GRW	Cobalt	1.1 U	4.1	1.1	|Diff| <2xRL	J/UJ TvP-I
PR3-T01N-GRW PR3-D01N-GRW	Copper	9.1	19.8	0.7	|Diff| <2xRL	J TvP-I
	Zinc	36.5	85.6	30.0		
SC–1B-T01N-GRW SC-1B-D01N-GRW	Cobalt	3.0	6.3	1.1	|Diff| <2xRL	J TvP-I

RL=Reporting Limit U=Non-Detect T=Total D=Dissolved

Total P/Ortho-P = Inorganics analysis of Total Phosphorus (Total fraction) and Orthophosphate (partial fraction under Dissolved fraction)

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT288A Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike Date Completed: 06/02/04

Peer Reviewer: Stacey Coker Date Completed: 06/04/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics
P-5C-T01N-GRW	SA	568246		W	X	X
P-5C-D01N-GRW	SA	568247		W	X	
P-5B-T01N-GRW	SA	568248		W	X	X
P-5B-D01N-GRW	SA	568249		W	X	
P-4B-T01N-GRW	SA	568250		W	X	X
P-4B-D01N-GRW	SA	568251		W	X	
MMW-24-T01N-GRW	SA	568252		W	X	X
MMW-24-D01N-GRW	SA	568253		W	X	
MMW-17B-T01N-GRW	SA	568254		W	X	X
MMW-17B-D01N-GRW	SA	568255		W	X	
WALDOSPRING-T01N-GRW	SA	568256	WALDOSPRING-T01N-GR	W	X	X
WALDOSPRING-D01N-GRW	SA	568257	WALDOSPRING-D01N-GR	W	X	
MMW-17A-T01N-GRW	SA	568258		W	X	X
MMW-17A-D01N-GRW	SA	568259		W	X	
MMW-28B-T01N-GRW	SA	568260		W	X	X
MMW-28B-D01N-GRW	SA	568261		W	X	
P-1-T01N-GRW	SA	568262		W	X	X
P-1-D01N-GRW	SA	568263		W	X	
CAPULINSPRING-T01N-GRW	SA	568264	CAPULINSPRNG-T01N-GRW CAPULINSPRING-T01N-G	W	X	X
CAPULINSPRING-D01N-GRW	SA	568265	CAPULINSPRNG-D01N-GRW CAPULINSPRING-D01N-G	W	X	

Matrix: W = Water QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken eight days after sampling. The pH for the same samples were measured approximately 2 days beyond sampling. Therefore, all conductivity and pH results were qualified as estimated (J). The original total phosphorus analysis for sample CAPULINSPRING-T01N-GRW, which was analyzed within holding time yielded a result that was significantly lower that the associated orthophosphate analysis. The laboratory suspected the difference was due to the sample matrix, as this sample turned a different color during the analysis. The sample was diluted and re-analyzed six days beyond holding time and yielded an acceptable result. The total phosphate result for CAPULINSPRING-T01N-GRW was qualified as estimated (J) due to exceedance of holding time. For samples MMW-17A-T01N-GRW, MMW-28B-T01N-GRW, P-1-T01N-GRW, and CAPULINSPRING-T01N-GRW, TKN was analyzed two days beyond holding time. The TKN results for these samples were qualified as estimated (J). The original nitrate analyses in this SDG were analyzed within holding time. However, due to an elevated concentration of nitrate, certain samples required re-analysis, which was accomplished the following day, one day beyond holding time. The calibration blanks from this sequence also exhibited elevated concentrations resulting in the need for additional re-analyses, which were accomplished eight days beyond holding time. Sample CAPULINSPRING-T01N-GRW was analyzed 19 days past holding time for nitrate. These results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Chloride and various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD LD	N/A	Matrix QC was not included in this SDG. No qualifications of data were necessary. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (C) P-5C-T01N-GRW Total vs. Partial Analyses Cation/Anion Balance Internal Standards	Yes	The serial dilution analyses run on the matrix spikes of sample DECANT-T01N-SFW was only applicable for 1 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. No qualification of data results was necessary. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances There were several internal standard recoveries outside evaluation criteria. However, none of the associated analytes were reported from the ICPMS but from the ICP. No qualifications of data were necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC Field Duplicate Rinsate Blank	N/A	There were no field QC samples included in this SDG; therefore, no qualifications of data were necessary. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. All Parameters: Laboratory Control Sample Results. All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate	TKN	Phosphorus	Cond. (µmhos/cm)	pH (std units)
P-5C-T01N-GRW				1300 J	4.9 J
P-5B-T01N-GRW				1070 J	5.0 J
P-4B-T01N-GRW				1120 J	5.1 J
MMW-24-T01N-GRW				2570 J	5.1 J
MMW-17B-T01N-GRW	0.31 J			654 J	5.0 J
WALDOSPRING-T01N-GRW	0.26 J			667 J	4.7 J
MMW-17A-T01N-GRW	0.30 J	0.24 J		653 J	4.7 J
MMW-28B-T01N-GRW	0.52 J	0.24 UJ		893 J	3.6 J
P-1-T01N-GRW	1.9 J	0.24 UJ		1120 J	4.6 J
CAPULINSPRING-T01N-GRW	4.2 J	0.80 J	19.6 J	8810 J	3.0 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum DF=100	---	46.1	31.8	33.2	2088.0	17.6	MMW-17A-T01N-GRW MMW-17A-D01N-GRW MMW-17B-T01N-GRW MMW-17B-D01N-GRW MMW-28B-T01N-GRW MMW-28B-D01N-GRW WALDOSPRING-D01N-GRW WALDOSPRING-T01N-GRW	U MB,CCB-I
Cadmium DF=100	---	0.4	---	---	36.7	0.3	WALDOSPRING-D01N-GRW MMW-17A-D01N-GRW MMW-17B-D01N-GRW MMW-24-T01N-GRW MMW-24-D01N-GRW MMW-28B-T01N-GRW MMW-28B-D01N-GRW P-1-T01N-GRW P-1-D01N-GRW P-4B-T01N-GRW P-4B-D01N-GRW P-5B-T01N-GRW P-5B-D01N-GRW P-5C-T01N-GRW P-5C-D01N-GRW	U MB,CCB-I U MB-I
Copper DF=100	1.0	1.7	---	1.1	---	0.7	MMW-17A-T01N-GRW MMW-17A-D01N-GRW MMW-17B-T01N-GRW MMW-17B-D01N-GRW MMW-28B-T01N-GRW MMW-28B-D01N-GRW P-1-T01N-GRW P-1-D01N-GRW P-4B-T01N-GRW P-4B-D01N-GRW P-5B-T01N-GRW P-5B-D01N-GRW WALDOSPRING-D01N-GRW	U CCB-I
Iron DF=100	24.0	35.4	20.9	27.0	2119.0	19.2	MMW-17A-D01N-GRW MMW-17B-D01N-GRW MMW-24-T01N-GRW MMW-24-D01N-GRW MMW-28B-T01N-GRW MMW-28B-D01N-GRW P-1-D01N-GRW P-4B-D01N-GRW P-5C-T01N-GRW WALDOSPRING-D01N-GRW	U MB,CCB-I
Molybdenum DF=10	---	---	1.5	1.5	---	1.4	CAPULINSPRING-T01N-GRW CAPULINSPRING-D01N-GRW	U CCB-I
Potassium DF=100	-581.1	-528.4	-198.6	-547.5	-33170.0	109.3	All samples in this SDG	UJ MB,CCB-L
Sodium DF=100	-247.7	---	---	---	---	172.6	P-4B-T01N-GRW P-4B-D01N-GRW P-5B-T01N-GRW P-5B-D01N-GRW P-5C-T01N-GRW P-5C-D01N-GRW	J/UJ CCB-L
Chloride DF=10	---	---	---	---	0	0.20	P-5B-T01N-GRW P-4B-T01N-GRW	U MB-I

CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit
Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT289A Sampling Event: April 2004 GRW and SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 05-28-04

Peer Reviewer: Stacey Coker Date Completed: 06-01-04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
GOATHILLSPRING-T01N-GRW	SA	568311	GOATHILLSPRG-T01N-GRW GOATHILLSPRG-T01N-G	W	X	X
GOATHILLSPRING-D01N-GRW	SA	568312	GOATHILLSPRG-D01N-GRW GOATHILLSPRG-D01N-G	W	X	
GOATHILLSPRING-T01D-GRW	FD	568313	GOATHILLSPRG-T01D-GRW GOATHILLSPRG-T01D-G	W	X	X
GOATHILLSPRING-D01D-GRW	FD	568314	GOATHILLSPRG-D01D-GRW GOATHILLSPRG-D01D-G	W	X	
GOATHILLSPRINGSOURCE-T01N-GRW	SA	568315	GOATSPSOURCE-T01N-GRW GOATSPSOURCE-T01N-G	W	X	X
GOATHILLSPRINGSOURCE-D01N-GRW	SA	568316	GOATSPSOURCE-D01N-GRW GOATSPSOURCE-D01N-	W	X	
CAPULINSPRINGSOURCE-T01N-GRW	SA	568317	CAPSPGSOURCE-T01N-GRW CAPSPGSOURCE-T01N-G	W	X	X
CAPULINSPRINGSOURCE-D01N-GRW	SA	568318	CAPSPGSOURCE-D01N-GRW CAPSPGSOURCE-D01N-	W	X	
MMW-23A-T01N-GRW	SA	568319		W	X	X
MMW-23A-D01N-GRW	SA	568320		W	X	
HAUT-N-TAUT-T01N-GRW	SA	568321	HAUTNTAUT-T01N-GRW	W	X	X
HAUT-N-TAUT-D01N-GRW	SA	568322	HAUTNTAUT-D01N-GRW	W	X	
SC-5A-T01N-GRW	SA	568323		W	X	X
SC-5A-D01N-GRW	SA	568324		W	X	
SC-7A-T01N-GRW	SA	568325		W	X	X
SC-7A-D01N-GRW	SA	568326		W	X	
SC-6A-T01N-GRW	SA	568327		W	X	X
SC-6A-D01N-GRW	SA	568328		W	X	
P-3-T01N-GRW	SA	568329		W	X	X
P-3-D01N-GRW	SA	568330		W	X	
RB04T-GRW	RB	568331		W	X	X
RB04D-GRW	RB	568332		W	X	

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues mentioned in the case narrative are addressed in the review table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken six days beyond log-in. The pH measurements were taken 4 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various analytes were detected in the preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD PDS LD	NA	The matrix quality control results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (C) GOATHILLSPRING-T01N-GRW Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analysis performed on sample GOATHILLSPRING-T01N-GRW was applicable for 6 of the 24 metal analytes. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. Table 1.3 displays the one serial dilution result outside acceptance limits. The serial dilution results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. Table 1.4 lists the results for total versus partial agreement outside acceptance criteria. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion except samples GOATHILLSPRING-T01N/D01N-GRW and RB04T/D-GRW which yielded percent differences of –14.25% and 90.69%, respectively. For sample RB04T/D-GRW no qualification was applied because the high percent difference is a result of the elevated metals reporting limits. For sample GOATHILLSPRING-T01N/D01N-GRW, the elevated percent difference is likely a reflection of the high sulfate result (16,600 mg/L) which comprises 96.7% of the anion sum. The field duplicate sample for GOATHILLSPRING-T01N/D01N-GRW yielded an acceptable difference of –5.13% and a lower sulfate result of 13,500 mg/L. No qualification based on cation/anion balance was assigned. The ratios of the calculated versus measured TDS for all field samples were within the acceptance range of 0.5 and 1.5 except sample RB04T/D-GRW which yielded a TDS ratio of 12.13. No qualification was applied because the high TDS ratio is a result of the elevated metals reporting levels.

Review Parameter	Criteria Met?	Comments
Field QC Field Duplicate GOATHILLSPRING-T01D-GRW GOATHILLSPRING-D01D-GRW Rinsate Blank RB04T-GRW RB04D-GRW Field Blank Trip Blank	No	Table 1.5 lists the field duplicate results outside acceptance criteria. Table 1.6 lists the rinsate blank detections found. The field QC results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. Two laboratory control samples were performed for mercury yielding percent recoveries of 102% and 72%. Because the average of the two recoveries are within the QC acceptance limits of 75-125%, no qualification was issued. All other LCS results were within the acceptance range of 75-125%, therefore, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Chloride (mg/L)	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Orthophosphate (mg/L)	Cond. (µmhos/cm)	pH (std units)
GOATHILLSPRING-T01N-GRW	---	1.8 J	0.098 J	---	8600 J	2.8 J
GOATHILLSPRING-T01D-GRW	---	1.0 UJ	0.041 J	---	8690 J	3.0 J
GOATHILLSPRINGSOURCE-T01N-GRW	---	1.0 UJ	0.11 J	0.095 J	14300 J	3.0 J
CAPULINSPRINGSOURCE-T01N-GRW	---	1.0 UJ	0.053 J	0.37 J	9060 J	3.1 J
MMW-23A-T01N-GRW	8.5 J	0.75 J	---	---	1850 J	4.3 J
HAUT-N-TAUT-T01N-GRW	---	0.68 J	---	---	1410 J	3.3 J
SC-5A-T01N-GRW	---	0.21 J	0.0050 UJ	---	1380 J	3.7 J
SC-7A-T01N-GRW	---	0.20 UJ	0.0050 UJ	0.034 J	1350 J	4.2 J
SC-6A-T01N-GRW	---	0.20 UJ	0.0050 UJ	---	2300 J	3.9 J
P-3-T01N-GRW	---	1.8 J	0.0050 UJ	0.010 UJ	1080 J	4.8 J
RB04T-GRW	---	0.20 UJ	0.0050 UJ	0.010 UJ	0.55 J	4.8 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	PBW 0519A (µg/l)	PBW 0519C (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Chloride 5/11/04	250	215	269	---	---	---	230	200	HAUT-N-TAUT-T01N-GRW SC-5A-T01N-GRW SC-7A-T01N-GRW	U CCB,MB-I
Chloride 5/20/04	U	474	U	---		280		200	MMW-23A-T01N-GRW	U MB-I
Arsenic (P) DF=10	4.2	5.2	4.4	3.8	U	U	---	3.7	GOATHILLSPRING-T01N-GRW GOATHILLSPRING-D01N-GRW GOATHILLSPRING-T01D-GRW GOATHILLSPRING-D01D-GRW GOATHILLSPRINGSOURCE-T01N-GRW GOATHILLSPRINGSOURCE-D01N-GRW CAPULINSPRINGSOURCE-T01N-GRW CAPULINSPRINGSOURCE-D01N-GRW MMW-23A-T01N-GRW MMW-23A-D01N-GRW HAUT-N-TAUT-D01N-GRW SC-7A-T01N-GRW SC-7A-D01N-GRW P-3-T01N-GRW P-3-D01N-GRW RB04T-GRW	U CCB-I
Beryllium (P) DF=10	-2.7	0.5	U	0.6	-2.969	U	---	0.3	MMW-23A-T01N-GRW MMW-23A-D01N-GRW HAUT-N-TAUT-T01N-GRW HAUT-N-TAUT-D01N-GRW SC-5A-T01N-GRW SC-5A-D01N-GRW SC-7A-T01N-GRW SC-7A-D01N-GRW SC-6A-T01N-GRW SC-6A-D01N-GRW P-3-T01N-GRW P-3-D01N-GRW RB04T-GRW RB04D-GRW	J MB-L or UJ CCB,MB-I or U CCB-I
Boron (P) DF=10	4.0	U	U	U	6.386	U	---	3.6	MMW-23A-D01N-GRW	U MB-I
Cadmium (P) DF=100	U	U	U	1.5	U	1.623	---	1.0	SC-7A-T01N-GRW SC-7A-D01N-GRW SC-6A-T01N-GRW SC-6A-D01N-GRW P-3-D01N-GRW RB04T-GRW	U MB-I OR U CCB,MB-I
Cobalt (P) DF=100	U	U	U	U	U	2.164	---	1.8	SC-5A-T01N-GRW SC-7A-T01N-GRW SC-7A-D01N-GRW SC-6A-T01N-GRW SC-6A-D01N-GRW	U MB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	PBW 0519A (µg/l)	PBW 0519C (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Molybdenum (P) DF=10	2.4	2.8	2.2	1.4	U	U	---	1.4	GOATHILLSPRING-T01N-GRW GOATHILLSPRING-D01N-GRW GOATHILLSPRING-T01D-GRW GOATHILLSPRING-D01D-GRW GOATHILLSPRINGSOURCE-T01N-GRW GOATHILLSPRINGSOURCE-D01N-GRW CAPULINSPRINGSOURCE-T01N-GRW CAPULINSPRINGSOURCE-D01N-GRW MMW-23A-T01N-GRW MMW-23A-D01N-GRW P-3-T01N-GRW RB04T-GRW RB04D-GRW	
Nickel (P) DF=100	U	U	U	U	U	3.91	---	3.3	SC-5A-D01N-GRW SC-7A-T01N-GRW SC-7A-D01N-GRW SC-6A-T01N-GRW SC-6A-D01N-GRW	U MB-I
Sodium (MS) DF=100	U	U	U	U	U	428.9	---	327.5	SC-5A-D01N-GRW SC-6A-T01N-GRW SC-6A-D01N-GRW RB04T-GRW RB04D-GRW	U MB-I

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit U=Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed. Two method blanks were prepared for metals analysis, PBW0519A and PBW0519C.

Table 1.3
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification
GOATHILLSPRING-T01N-GRW		
Beryllium	20.0	J DL-H

Table 1.4
Total vs. Partial Qualifications

Sample	Orthophosphate Concentration (mg/L)	RL (mg/L)	Phosphorous Concentration (mg/L)	RL (mg/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
GOATHILLSPRING-T01N-GRW	12.9	0.5	0.022	0.01	Diff. > 2xRL	25.8xRL	J TvP-I
GOATHILLSPRING-T01D-GRW	0.041	0.005	0.027	0.01	RPD > 30%	41%	J TvP-I
GOATHILLSPRINGSOURCE-T01N-GRW	0.095	0.01	0.022	0.01	Diff. > 2xRL	7.3xRL	J TvP-I
CAPULINSPRINGSOURCE-T01N-GRW	0.37	0.01	0.031	0.01	Diff. > 2xRL	33.9xRL	J TvP-I

Table 1.5
Field Duplicate Qualifications

Sample	Analyte	Sample Conc. (mg/L)	RL (mg/L)	Duplicate Conc. (mg/L)	RL (mg/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
GOATHILLSPRING-T01N/T01D-GRW	Total Suspended Solids	153	1.0	58.6	1.0	RPD > 30%	89%	J FD-I
	Chloride	256	4.0	123	4.0	RPD > 30%	70%	J FD-I
	Nitrite	0.098	0.01	0.041	0.005	Diff. > 2xRL	11.4xRL	J FD-I
	Orthophosphate	12.9	0.5	0.26	0.01	Diff. > 2xRL	25.3xRL	J FD-I

Table 1.6
Rinsate Blank Detections

Analyte	RL (mg/L)	Concentration (mg/L)
RB04T-GRW		
Total Dissolved Solids	5.0	9.0
Total Suspended Solids	0.50	0.8
Chloride	0.40	0.63
Bicarbonate Alkalinity	1.0	2.7
Total Alkalinity	1.0	2.7
Ammonia	0.040	0.097

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT290A Sampling Event: April 2004 GRW and SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 05-27-04

Peer Reviewer: Stacey Coker Date Completed: 06-01-01

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
MMW-10C-T01N-GRW	SA	568509		W	X	X
MMW-10C-D01N-GRW	SA	568510		W	X	
HANSEN-T01N-GRW	SA	568511		W	X	X
HANSEN-D01N-GRW	SA	568512		W	X	
COLUMBINE02-T01N-GRW	SA	568513	COLUMBINE02-T01N-GR	W	X	X
COLUMBINE02-D01N-GRW	SA	568514	COLUMBINE02-D01N-GR	W	X	
MMW-36B-T01N-GRW	SA	568515		W	X	X
MMW-36B-D01N-GRW	SA	568516		W	X	
MMW-31A-T01N-GRW	SA	568517		W	X	X
MMW-31A-D01N-GRW	SA	568518		W	X	
MMW-44A-T01N-GRW	SA	568519		W	X	X
MMW-44A-D01N-GRW	SA	568520		W	X	
MMW-27A-T01N-GRW	SA	568521		W	X	X
MMW-27A-D01N-GRW	SA	568522		W	X	
MMW-11A-T01N-GRW	SA	568523		W	X	X
MMW-11A-D01N-GRW	SA	568524		W	X	
MMW-11A-T01D-GRW	FD	568525		W	X	X
MMW-11A-D01D-GRW	FD	568526		W	X	
MMW-39A-T01N-GRW	SA	568527		W	X	X
MMW-39A-D01N-GRW	SA	568528		W	X	

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues mentioned in the case narrative are addressed in the review table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken five days beyond log-in. The pH measurements were taken 5 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various analytes were detected in the preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD MMW-27A-T01N-GRWS MMW-27A-D01N-GRWS PDS MMW-27A-T01N-GRWA MMW-27A-D01N-GRWA LD MMW-27A-T01N-GRWD MMW-27A-D01N-GRWD	No	Tables 1.3 and 1.4 list the matrix spike and laboratory duplicate results outside QC acceptance criteria, respectively and the resultant qualification issued. The matrix quality control results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (C) MMW-27A-T01N-GRWSL MMW-27A-D01N-GRWSL Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analyses performed on the matrix spike of samples MMW-27A-T01N-GRW and MMW-27A-D01N-GRW were applicable for 3 of the 24 metal analytes. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. All three applicable serial dilution results for each sample were within QC acceptance criteria. The serial dilution results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within the acceptance range of 0.5 and 1.5.
Field QC Field Duplicate MMW-11A-T01D-GRW Rinsate Blank Field Blank Trip Blank	No	Table 1.5 lists the field duplicate results outside acceptance criteria. The field QC results for the April 2004 GRW and SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	No	A data sheet summarizing the cyanide result for sample MMW-10C-T01N-GRW was not supplied in the data package. According to the cyanide raw data sheets, the sample was analyzed and the result was nondetect. The laboratory was contacted to obtain the missing form.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Orthophosphate (mg/L)	Cond. (µmhos/cm)	pH (std units)
MMW-10C-T01N-GRW	---	---	---	739 J	5.3 J
HANSEN-T01N-GRW	---	---	---	2460 J	4.3 J
COLUMBINE02-T01N-GRW	1.2 J	0.0050 UJ	0.010 UJ	793 J	6.1 J
MMW-36B-T01N-GRW	---	---	---	3900 J	4.7 J
MMW-31A-T01N-GRW	2.6 J	0.0050 UJ	0.018 J	1800 J	4.7 J
MMW-44A-T01N-GRW	0.42 J	0.0050 UJ	0.049 J	3030 J	3.9 J
MMW-27A-T01N-GRW	2.9 J	0.0050 UJ	0.030 J	1790 J	4.7 J
MMW-11A-T01N-GRW	---	---	0.039 J	1790 J	4.7 J
MMW-11A-T01D-GRW	---	---	0.035 J	1810 J	4.7 J
MMW-39A-T01N-GRW	19.0 J	0.0050 UJ	0.014 J	4160 J	4.8 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Chloride 4/26/04	348	333	311	---	310	200	MMW-31A-T01N-GRW	U CCB,MB-I
Chloride 5/11/04	250	215	269	---	230	200	MMW-10C-T01N-GRW HANSEN-T01N-GRW	U CCB,MB-I or U CCB-I
Beryllium (P) DF=10	U	U	U	U	-0.3368	0.3	MMW-10C-T01N-GRW MMW-10C-D01N-GRW COLUMBINE02-T01N-GRW COLUMBINE02-D01N-GRW MMW-36B-T01N-GRW MMW-36B-D01N-GRW MMW-11A-D01D-GRW	UJ MB-L OR J MB-L
Silver (MS) DF=10	-0.2	-0.2	-0.2	-0.2	-0.1711	0.1	All samples in this data package	UJ CCB,MB-L

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit U=Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results And Parent Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Comment	Action
MMW-27A-T01N-GRW					
Total Alkalinity	11%	NA	75-125%	Acidic nature of sample neutralizes the bicarbonate spike resulting in reduced recovery	No Qualification
Total Organic Carbon	0%	NA		Matrix spike result was analyzed with a five-fold dilution and found to be nondetect. A recovery of 48.2% is calculated if RL value is used instead of zero.	J MS-L for parent sample
Iron	0.0%	98.5%		Difference between the spike level and the dilution adjusted RL is < 1xRL	No Qualification
Cyanide	47.9%	NA		None	UJ MS-L for parent sample
MMW-27A-D01N-GRW					
Iron	0.0%	97.6%	75-125%	Difference between the spike level and the dilution adjusted RL is < 1xRL	No Qualification

NA = Not appropriate ND = Nondetect RL = Reporting limit (generally the IDL adjusted for dilution) IDL = Instrument detection limit

Table 1.4
Laboratory Duplicate Qualifications

Sample	Analyte	Sample Conc. (mg/L)	Duplicate Conc. (mg/L)	RL (mg/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
MMW-27A-T01N-GRW	Phosphorous	0.042	0.060	0.010	Diff. > 1xRL	1.8xRL	J D-I

Table 1.5
Field Duplicate Qualifications

Sample	Analyte	Sample Conc. (mg/L)	Duplicate Conc. (mg/L)	RL (mg/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
MMW-11A-T01N/T01D-GRW	Total Suspended Solids	2.7	1.5	0.50	Diff. > 2xRL	2.4xRL	J FD-I

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT291A Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 06/02/04

Peer Reviewer: Stacey Coker Date Completed: 06/03/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
MMW-11-T01N-GRW	SA	568529		W	X	X
MMW-11-D01N-GRW	SA	568530		W	X	
RB03T-GRW	RB	568531		W	X	X
RB03D-GRW	RB	568532		W	X	
HANSENCREEK-T01N-SFW	SA	568533	HANSENCREEK-T01N-SF	W	X	X
HANSENCREEK-D01N-SFW	SA	568534	HANSENCREEK-D01N-SF	W	X	
SPRING14MA-T01N-GRW	SA	568668		W	X	X
SPRING14MA-D01N-GRW	SA	568669		W	X	
SPRING14M-T01N-GRW	SA	568670		W	X	X
SPRING14M-D01N-GRW	SA	568671		W	X	
MMW-32A-T01N-GRW	SA	568672		W	X	X
MMW-32A-D01N-GRW	SA	568673		W	X	
MMW-10A-T01N-GRW	SA	568674		W	X	X
MMW-10A-D01N-GRW	SA	568675		W	X	
LABOBITA-T01N-GRW	SA	568676		W	X	X
LABOBITA-D01N-GRW	SA	568677		W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

The laboratory case narrative noted that the samples received on 04/24/04 were analyzed for nitrate, nitrite, and orthophosphate one day beyond the prescribed analytical holding time of 48 hours. However, upon review of the raw data and comparisons between the analytical holding time for each specific sample with the sampling date and time, it was concluded that not all of the analyses for these samples were performed outside of holding time. Table 1.1 summarizes the samples qualified as estimated on the basis of holding time.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Several sample results for nitrate, nitrite, and orthophoshpate were qualified as estimated (J/UJ). Samples were analyzed in excess of 48 hours, but less than 2x the prescribed analytical holding time. Accordingly, it was not necessary to consider rejecting nondetect results. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 12-13 days after sampling and 10-11 days beyond log-in. The pH for the same samples were measured approximately four to five hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Chloride was detected in the method blank run on 05/08/04 at a concentration of 0.25 mg/L. Due to the fact that all sample results for chloride were in excess of 5x the blank detection or not reported from this run, no qualification of data was necessary. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD PDS LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (A) MMW-11-T01N-GRWL Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analysis run on sample MMW-11-T01N-GRW was applicable for only one (manganese) of the 24 analytes. The remaining analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent difference (between initial and serial dilution results) for manganese was reviewed for a percentage in excess of 10% As the %D for manganese was 1.9%, no qualification of data results was necessary. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. Zinc results for samples MMW-32A-T01N-GRW and MMW-32A-D01N-GRW were qualified as estimated (J) on the basis of total vs. partial imbalance. The total fraction for zinc was 2240 ug/L, whereas the partial fraction recovered zinc at 3870 ug/L. As both zinc concentrations were in excess of 5x the RL (adjusted for a 100 fold dilution), the partial zinc fraction was evaluated to be approximately 72% greater than the total zinc fraction, thereby not meeting the evaluative criteria of 30%. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion, with the exception of rinsate blank sample RB03*-GRW, which reported an 88.61% balance. As the concentrations were low enough that the reporting limits controlled the calculations, the cation/anion %D was not representative of this comparison and therefore did not result in data qualification. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5, with the exception of rinsate blank sample RB03*-GRW, which reported a TDS ratio of 11.08. The elevated TDS ratio indicated that the TDS calculated concentration was high relative to the measured TDS concentration. The concentrations in this sample were low enough that the reporting limits controlled the calculations. The TDS ratio for this sample was therefore not an appropriate measure of accuracy. No qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC Field Duplicate Rinsate Blank RB03T-GRW RB03D-GRW Field Blank Trip Blank	N/A	This SDG did not include the analysis of field QC samples. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. As noted in the laboratory case narrative, the blank spike duplicate (LCSDW0430D) associated with the analysis of mercury resulted in a percent recovery (71%) that was slightly below the control limit of 75-125%. Due to the fact that the associated blank spike yielded an acceptable recovery (91%), and the average of the two recoveries (81%) was well within the criteria range, no qualification of mercury results was considered necessary. This did not affect the quality or usability of the data. All remaining LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
MMW-11-T01N-GRW	---	---	---	1780 J	4.8 J
RB03T-GRW	---	---	---	5.0 UJ	5.4 J
HANSENCREEK-T01N-SFW	---	---	---	2240 J	4.0 J
SPRING14MA-T01N-GRW	---	---	---	735 J	5.3 J
SPRING14M-T01N-GRW	0.20 UJ	---	---	455 J	5.3 J
MMW-32A-T01N-GRW	2.1 J	0.0050 UJ	0.010 UJ	1870 J	6.1 J
MMW-10A-T01N-GRW	4.3 J	0.0050 UJ	0.029 J	1910 J	5.0 J
LABOBITA-T01N-GRW	0.33 J	0.0050 UJ	0.010 UJ	796 J	5.2 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Sodium (P)	---	---	-354.9	---	327.5	MMW-10A-T01N-GRW MMW-10A-D01N-GRW MMW-32A-T01N-GRW MMW-32A-D01N-GRW SPRING14MA-T01N-GRW SPRING14MA-D01N-GRW SPRING14-T01N-GRW SPRING14-D01N-GRW	UJ CCB-L
Zinc (P)	-2.4	-2.8	-4.0	---	2.4	LABOBITA-T01N-GRW LABOBITA-D01N-GRW RB03T-GRW RB03D-GRW SPRING14MA-T01N-GRW SPRING14MA-D01N-GRW SPRING14-T01N-GRW SPRING14-D01N-GRW	J CCB-L UJ CCB-L

P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT292C Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 06/02/04

Peer Reviewer: Stacey Coker Date Completed: 06/03/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
MMW-31B-T01N-GRW	SA	568584		W	X	X
MMW-31B-D01N-GRW	SA	568585		W	X	
CC2A-T01N-GRW	SA	568586		W	X	X
CC2A-D01N-GRW	SA	568587		W	X	
COLUMBINE01-T01N-GRW	SA	568588	COLUMBINE01-T01N-GR	W	X	X
COLUMBINE01-D01N-GRW	SA	568589	COLUMBINE01-D01N-GR	W	X	
MMW-44B-T01N-GRW	SA	568590		W	X	X
MMW-44B-D01N-GRW	SA	568591		W	X	
MMW-29B-T01N-GRW	SA	568592		W	X	X
MMW-29B-D01N-GRW	SA	568593		W	X	
CC2B-T01N-GRW	SA	568594		W	X	X
CC2B-D01N-GRW	SA	568595		W	X	
CC1B-T01N-GRW	SA	568596		W	X	X
CC1B-D01N-GRW	SA	568597		W	X	
CC1A-T01N-GRW	SA	568598		W	X	X[3]
CC1A-D01N-GRW	SA	568599		W	X	

Matrix: W = Water QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

[3]Reduced inorganics list due to limited sample volume.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, samples MMW-44B-T01N-GRW, MMW-29B-T01N-GRW, and CC2B-T01N-GRW for cyanide analysis were received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect results for these samples were qualified as estimated (UJ), with an indeterminate bias direction. In addition, there was a minor inadvertent error on the COC form which the laboratory did not comment on. For CC1A-T01N-GRW, the field COCs indicate that only a W-1 and W-6 bottle were collected and subsequently submitted for analysis due to the limited sample volume available. However, the laboratory COC indicates that W-3, W-5 (2x), and W-8 bottles were also sent, but they were never filled.
Holding Times	No	The majority of sample results for nitrate, nitrite, and orthophoshpate were qualified as estimated (J/UJ). Samples were analyzed in excess of 48 hours, but less than 2x the prescribed analytical holding time. Accordingly, it was not necessary to consider rejecting nondetect results. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 13 days after sampling and 11 days beyond log-in. The pH for the same samples were measured approximately five hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Chloride was detected in the method blank run on 05/08/04 at a concentration of 0.25 mg/L. Due to the fact that all sample results for chloride were in excess of 5x the blank detection or not reported from this run, no qualification of data was necessary. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD PDS LD	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution (C) MMW-31B-T01N-GRW Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analysis run on sample MMW-31B-T01N-GRW was applicable for ten of the 24 analytes. The remaining analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) for the applicable analytes were reviewed for percentages in excess of 10% Table 1.3 summarizes the three results for sample MMW-31B-T01N-GRW which were qualified as estimated (J/UJ) on the basis of serial dilution. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. Twelve sample results were qualified as a result of total vs partial comparisons. Table 1.4 summarizes the samples and resultant qualifications. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances.

Review Parameter	Criteria Met?	Comments
		Samples MMW-31B-T01N-GRW, MMW-31B-D01N-GRW, COLUMBINE01-T01N-GRW, and COLUMBINE01-D01N-GRW reported elevated recoveries for the internal standard ^{89}Y. The analytes associated with this internal standard, beryllium and molybdenum, were reported from the trace ICP. The trace ICP reporting limits for the afore mentioned analytes met the requirements of the QAPP such that the change in instrumentation did not affect the usability of the data. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC Field Duplicate Rinsate Blank Field Blank Trip Blank	N/A	This SDG did not include the analysis of field QC samples. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
MMW-31B-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	2470 J	6.9 J
CC2A-T01N-GRW	0.43 J	0.0050 UJ	0.010 UJ	758 J	7.1 J
COLUMBINE01-T01N-GRW	1.6 J	0.0050 UJ	0.010 UJ	1060 J	6.0 J
MMW-44B-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	2540 J	7.2 J
MMW-29B-T01N-GRW	0.20 UJ	---	0.010 UJ	944 J	7.6 J
CC2B-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	1500 J	7.4 J
CC1B-T01N-GRW	0.23 J	0.0050 UJ	0.010 UJ	515 J	7.7 J
CC1A-T01N-GRW	0.51 J	0.0050 UJ	0.010 UJ	385 J	7.7 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminium (P)	39.7*	81.7*	32.5	---	---	---	176.0	CC1A-D01N-GRW CC1B-T01N-GRW MMW-29B-T01N-GRW MMW-29B-D01N-GRW MMW-44B-T01N-GRW	U CCB-I
Antimony (MS)	0.7	0.7	0.7	0.8	0.8	1.386	0.4	All sample results were qualified	U MB,CCB-I
Beryllium (P)	---	0.3	0.3	---	---	---	0.2	CC1A-D01N-GRW CC1B-T01N-GRW CC2B-T01N-GRW CC2B-D01N-GRW MMW-29B-T01N-GRW MMW-29B-D01N-GRW	U CCB-I
Boron (P)	---	---	---	---	---	3.404	1.8	CC1A-D01N-GRW CC1B-T01N-GRW CC1B-D01N-GRW CC2B-T01N-GRW CC2B-D01N-GRW COLUMBINE01-T01N-GRW COLUMBINE01-D01N-GRW MMW-29B-T01N-GRW MMW-29B-D01N-GRW MMW-31B-T01N-GRW MMW-31B-D01N-GRW	U MB-I
Cadmium (P)	---	---	0.5	---	---	-0.342	0.3	CC1A-T01N-GRW CC1A-D01N-GRW CC1B-T01N-GRW CC1B-D01N-GRW CC2A-T01N-GRW CC2A-D01N-GRW CC2B-T01N-GRW CC2B-D01N-GRW MMW-29B-T01N-GRW MMW-29B-D01N-GRW MMW-44B-T01N-GRW MMW-44B-D01N-GRW	UJ MB-L J MB-L
Copper (P)	---	---	2.4	---	---	-1.396	0.7	CC1A-D01N-GRW CC1B-D01N-GRW CC1B-T01N-GRW CC2A-T01N-GRW CC2A-D01N-GRW CC2B-T01N-GRW CC2B-D01N-GRW MMW-29B-T01N-GRW MMW-29B-D01N-GRW MMW-31B-T01N-GRW MMW-31B-D01N-GRW MMW-44B-T01N-GRW MMW-44B-D01N-GRW	UJ MB,CCB-L J MB-L UJ MB-L
Iron (P)	32.7*	61.2*	25.1	---	---	---	192.0	CC2B-T01N-GRW MMW-29B-T01N-GRW MMW-29B-D01N-GRW	U CCB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Potassium (P)	362.0	-335.5	-330.9	---	---	382.2	109.3	CC1B-T01N-GRW CC1B-D01N-GRW MMW-29B-T01N-GRW MMW-29B-D01N-GRW	U MB-I
Molybdenum (P)	---	---	1.4	---	---	---	1.0	CC1A-D01N-GRW CC1B-T01N-GRW CC1B-D01N-GRW	U CCB-I
Sodium (P)	773.3* 751.9	-865.6* 321.0	451.1	---	---	6026.0	172.6	CC1A-T01N-GRW CC1A-D01N-GRW CC1B-T01N-GRW CC1B-D01N-GRW CC2A-T01N-GRW CC2A-D01N-GRW COLUMBINE01-D01N-GRW COLUMBINE01-D01N-GRW MMW-29B-T01N-GRW MMW-29B-D01N-GRW MMW-31B-T01N-GRW MMW-31B-D01N-GRW	U MB-I UJ CCB-L U CCB-I

P= ICP MS = Mass SpectroscopyCCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

*Sample MMW-29B-T01N-GRW results reported for ICAP4

Table 1.3
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification
MMW-31B-T01N-GRW		
Cadmium	10.5	J DL-L
Cobalt	11.4	
Nickel	11.4	

Table 1.4
Total vs. Partial Results Not Meeting Acceptance Criteria and Data Qualification

Sample	Analyte	Total Metals (µgL)	Dissolved Metals (µg/L)	RL (µg/L)	Criteria	Qualification Codes
CC2A-T01N-GRW CC2A-D01N-GRW	Beryllium	18.3	25.7	0.2	D 30%>T	J TvP-I
	Zinc	838	1260	15		
	Manganese	7080	11500	19		
	Iron	4720	7600	192		
	Cobalt	2.6	6.6	1.1	|Diff|>2xRL	
COLUMBINE01-T01N-GRW COLUMBINE01-D01N-GRW	Cobalt	1.1 U	6.1	1.1	|Diff|>2xRL	J/UJ TvP-I

RL=Reporting Limit U=Non-Detect D =Dissolved T=Total

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT293C Sampling Event: April 2004 GRW/SFW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 06/03/04

Peer Reviewer: Stacey Coker Date Completed: 06/03/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
MMW-13-T01N-GRW	SA	568641		W	X	X
MMW-13-D01N-GRW	SA	568642		W	X	
MMW-32B-T01N-GRW	SA	568643		W	X	X
MMW-32B-D01N-GRW	SA	568644		W	X	
CHAMBERSPRING-T01N-GRW	SA	568645	CHAMBERSPRNG-T01N-GRW CHAMBERSPRNG-T01N-	W	X	X
CHAMBERSPRING-D01N-GRW	SA	568646	CHAMBERSPRNG-D01N-GRW CHAMBERSPRNG-D01N-	W	X	
MMW-25B-T01N-GRW	SA	568647		W	X	X
MMW-25B-D01N-GRW	SA	568648		W	X	
RB05T-GRW	RB	568649		W	X	X
RB05D-GRW	RB	568650		W	X	
002PUMPBACKDISCHARGE-T01N-GRW	SA	568651	PUMPBACKDSCH-T01N-GRW PUMPBACKDSCH-T01N-	W	X	X
002PUMPBACKDISCHARGE-D01N-GRW	SA	568652	PUMPBACKDSCH-D01N-GRW PUMPBACKDSCH-D01N-	W	X	
COLUMBINECANYON-T01N-GRW	SA	568653	COLCANYON-T01N-GRW	W	X	X
COLUMBINECANYON-D01N-GRW	SA	568654	COLCANYON-D01N-GRW	W	X	
MMW-10B-T01N-GRW	SA	568655		W	X	X
MMW-10B-D01N-GRW	SA	568656		W	X	
SC-8A-T01N-GRW	SA	568657		W	X	X
SC-8A-D01N-GRW	SA	568658		W	X	
MINE1-T01N-GRW	SA	568659		W	X	X
MINE1-D01N-GRW	SA	568660		W	X	

Matrix: W = Water QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified IDs are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: Any issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Several sample results for nitrate, nitrite, and orthophoshpate were qualified as estimated (J/UJ). Samples were analyzed in excess of 48 hours, but less than 2x the prescribed analytical holding time. Accordingly, it was not necessary to consider rejecting nondetect results. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 12 days after sampling and 10 days beyond log-in. The pH for the same samples were measured approximately four hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Chloride was detected in the method blank run on 05/08/04 at a concentration of 0.25 mg/L. Due to the fact that all sample results for chloride were in excess of 5x the blank detection or not reported from this run, no qualification of data was necessary. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD COLUMBINECANYON-T01N-GRWMS COLUMBINECANYON-D01N-GRWMS PDS COLUMBINECANYON-T01N-GRWA COLUMBINECANYON-D01N-GRWA LD COLUMBINECANYON-T01N-GRWD COLUMBINECANYON-D01N-GRWD	No	All matrix spike recoveries for metal analytes were recovered within the prescribed acceptance range. As such, none of results for metal analytes in either of the two parent samples were qualified on the basis of matrix spike recoveries. The matrix quality control results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment. Despite the fact that the laboratory duplicate summary forms reported RPDs in excess of the evaluation criterion for several analytes, no qualification of data was necessary when the CRDL was used in place of the IDL, adjusted for dilution, for the concentration-dependent comparison calculations.
Method QC Surrogates Serial Dilution (C) COLUMBINECANYON-T01N-GRWL COLUMBINECANYON-D01N-GRWL Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analyses run on the matrix spikes of samples COLUMBINECANYON-T01N-GRW and COLUMBINECANYON-D01N-GRW were applicable for 15 and 16 of the 24 analytes, respectively. The remaining analytes for each sample were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. As none of the %Ds for the applicable analytes were greater than 10%, no qualification of data results was necessary. The serial dilution results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5, with the exception of rinsate blank sample RB05*-GRW, which reported a TDS ratio of 2.47. The elevated TDS ratios indicated the TDS calculated concentration was high relative to the measured TDS concentration. The concentrations in this sample were low enough that the reporting limits controlled the calculations. The TDS ratio for this sample was therefore not an appropriate measure of accuracy. No qualification was considered necessary. Samples MMW-10B-T01N-GRW and MMW-10B-D01N-GRW reported elevated recoveries for the internal standard ^{89}Y. The analytes associated with this internal standard, beryllium and molybdenum, were reported from the trace ICP. The trace ICP reporting limits for the afore mentioned analytes met the requirements of the QAPP such that the change in instrumentation did not affect the usability of the data. No qualification of data was necessary on the basis of internal standard recoveries.
Field QC Field Duplicate Rinsate Blank RB05T-GRW RB05D-GRW Field Blank Trip Blank	Yes	Several analytes were detected in each of the rinsate blank samples. The effect on the data will be evaluated collectively with results of other rinsate blanks associated with this sampling event. The field QC results for the April 2004 GRW/SFW sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	N/A	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Ortho-P (mg/L)	Cond. (µmhos/cm)	pH (std units)
MMW-13-T01N-GRW	3.0 J	0.0050 UJ	0.010 UJ	1550 J	7.4 J
MMW-32B-T01N-GRW	0.20 UJ	0.0050 UJ	0.010 UJ	2490 J	7.1 J
CHAMBERSPRING-T0IN-GRW	---	---	---	236 J	8.2 J
MMW-25B-T01N-GRW	---	---	---	2210 J	7.3 J
RB05T-GRW	---	---	---	5.0 UJ	7.5 J
002PUMPBACKDISCHARGE-T01N-GRW	---	---	---	1510 J	7.8 J
COLUMBINECANYON-T01N-GRW	0.36 J	---	---	156 J	7.9 J
MMW-10B-T01N-GRW	0.86 J	0.0050 UJ	0.010 UJ	2320 J	6.5 J
SC-8A-T01N-GRW	0.32 J	0.0050 UJ	0.010 UJ	310 J	7.0 J
MINE1-T01N-GRW	0.54 J	0.0050 UJ	0.010 UJ	2760 J	7.7 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminium (P)	95.0	---	21.0	---	449.0	17.6	CHAMBERSPRING-T01N-GRW MMW-13-T01N-GRW MMW-13-D01N-GRW MMW-32B-D01N-GRW	U MB,CCB-I
Antimony (MS)	0.7	0.6	0.7	0.6	1.23		All samples were qualified	U MB,CCB-I
Chromium (P)	-0.7	---	---	---	---	0.6	CHAMBERSPRING-T01N-GRW CHAMBERSPRING-D01N-GRW MMW-13-T01N-GRW MMW-13-D01N-GRW MMW-25B-T01N-GRW MMW-25B-D01N-GRW MMW-32B-T01N-GRW MMW-32B-D01N-GRW	UJ CCB-L J CCB-L
Iron (P)	56.6	33.4	25.3	---	---	19.2	CHAMBERSPRING-T01N-GRW CHAMBERSPRING-D01N-GRW MMW-13-T01N-GRW MMW-32B-T01N-GRW MMW-32B-D01N-GRW RB05D-GRW	U CCB-I
Mercury (CV)	---	-0.1	---	---	---	0.1	CHAMBERSPRING-T01N-GRW CHAMBERSPRING-D01N-GRW COLUMBINECANYON-T01N-GRW COLUMBINECANYON-D01N-GRW MMW-13-T01N-GRW MMW-13-D01N-GRW MMW-25B-T01N-GRW MMW-25B-D01N-GRW MMW-32B-T01N-GRW MMW-32B-D01N-GRW 002PUMPBACKDISCHARGE-T01N-GRW 002PUMPBACKDISCHARGE-D01N-GRW RB05T-GRW RB05D-GRW	UJ CCB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Nickel (P)	-1.6	---	---	---	-2.246	1.5	CHAMBERSPRING-T01N-GRW CHAMBERSPRING-D01N-GRW COLUMBINECANYON-D01N-GRW MMW-13-T01N-GRW MMW-13-D01N-GRW MMW-25B-T01N-GRW MMW-25B-D01N-GRW MMW-32B-T01N-GRW MMW-32B-D01N-GRW 002PUMPBACKDISCHARGE-T01N-GRW 002PUMPBACKDISCHARGE-D01N-GRW RB05T-GRW RB05D-GRW SC-8A-T01N-GRW SC-8A-D01N-GRW	UJ MB,CCB-L J MB.CCB-L J MB-L
Silver (MS)	-0.1	-0.1	-0.1	-0.1	-0.26		All samples were qualified	UJ MB,CCB-L
Sodium (P)	---	457.9* -353.9	---	331.6* -412.9	--- -2870	327.5 * 172.6	CHAMBERSPRING-T01N-GRW CHAMBERSPRING-D01N-GRW COLUMBINECANYON-T01N-GRW COLUMBINECANYON-D01N-GRW RB05T-GRW RB05D-GRW SC-8A-T01N-GRW SC-8A-D01N-GRW	J MB,CCB-L UJ MB-L J MB-L U CCB-I

P= ICP MS = Mass SpectroscopyCV = Cold Vapor CCBx-Continuing Calibration Blank IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

*Samples analyzed on ICAP5

MOLYCORP RI/FS
DATA VALIDATION REPORT
FOR THE
MAY 2004 HISTORIC TAILINGS SPILL INVESTIGATION AND HUNTS POND SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

July 23, 2004

URS

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Non-Valid Matrix Spikes 3-1
3.2.2 Laboratory Performance Review (LPR) Findings 3-1

Section 4 Collective Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-2
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-5
4.3 ICP Serial Dilution Results 4-6

Section 5 Collective Assessment of Field QC Results 5-1

5.1 Field Duplicate Agreement 5-1
5.2 Rinsate Blank Results 5-3

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-2
6.3 Completeness 6-2
6.4 Representativeness 6-2
6.5 Comparability 6-3
6.6 Sensitivity 6-3

TABLE OF CONTENTS

List of Tables

Table 1-1	Summary of Samples Collected May 2004
Table 4-1	Field Samples Designated for Matrix QC Analysis
Table 4-2	Frequency Requirements for Matrix QC
Table 4-3	Soil Inorganics Matrix Spike Results
Table 4-4	Soil Metals Matrix Spike Results
Table 4-5	Inorganic Laboratory Duplicate Results
Table 4-6	Soil ICP Serial Dilution Results
Table 4-7	Soil ICP Serial Dilution Overall Assessment
Table 5-1	Summary of Field Duplicate Samples Collected May 2004
Table 5-2	Field Duplicate Collection Frequency
Table 5-3	Summary of Field Duplicate Sediment Sample Exceedances
Table 5-4	Summary of Rinsate Blank Samples Collected May 2004
Table 5-5	Summary of Rinsate Blank Results and Additional Qualifications
Table 6-1	Summary of Precision Assessment for May 2004
Table 6-2	Summary of Accuracy Assessment for May 2004

List of Attachments

Attachment 1.1	Data Review Summary for Data Package WAT297S
Attachment 1.2	Data Review Summary for Data Package WAT298A
Attachment 1.3	Data Review Summary for Data Package WAT299C
Attachment 1.4	Data Review Summary for Data Package SOL103
Attachment 1.5	Data Review Summary for Data Package SOL104
Attachment 1.6	Data Review Summary for Data Package SOL105
Attachment 1.7	Data Review Summary for Data Package SOL106
Attachment 1.8	Data Review Summary for Data Package SOL107
Attachment 1.9	Data Review Summary for Data Package SOL108
Attachment 1.10	Data Review Summary for Data Package SOL109
Attachment 1.11	Data Review Summary for Data Package SPLP02

This Data Validation Report (DVR) provides a general overview of the usability of the groundwater, surface water, sediment, and soil chemical data obtained during the Historic Tailings Spill Investigation and Hunts Pond Sampling Event at Molycorp Questa Mine in Questa, New Mexico. This report contains the results and process of the sample specific data reviews and collective evaluations for the samples collected in support of the Remedial Investigation/Feasibility Study (RI/FS) during the month of May 2004.

May 2004 RI/FS groundwater, surface water, sediment, and soil samples were submitted to Severn Trent Laboratories (STL) Burlington in Colchester, Vermont for chemical analysis. The number of samples collected and analyses conducted were in accordance with the RI/FS Field Sampling Plan. The analytical methods utilized were according to the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). Sample and QC results were reported in eleven original packages.

Table 1-1 summarizes the surface water, groundwater, soil, sediment, and leachate samples collected during this sampling event, along with the analyses performed on each sample and the accompanying QC samples.

Table 1-1
Summary of Samples Collected May 2004
Historic Tailings Spill Investigation and Hunts Pond Sampling Event

Sample Identification (SDG)	Total Metals	Inorganics		Sample Identification (SDG)	Total Metals	Inorganics
SURFACE WATER				**SOIL**		
GARDEN1-T01N-IRW (WAT297S)	X	X		ATD11C-T01N-SOL (SOL108)	X	X
HUNT1-T01N-SFW (WAT297S)	X, FD, MS/D	X, FD, MS/D		ATD14-T01N-SOL (SOL105)	X	X
HUNT2-T01N-SFW (WAT297S)	X	X		ATD16-T01N-SOL (SOL105)	X	X
LR4-T01N-SFW (WAT297S)	X	X		ATD19-1-T01N-SOL (SOL107)	X	X
LR-4U-T01N-SFW (WAT297S)	X	X		ATD1-T01N-SOL (SOL107)	X	X
LR6-T01N-SFW (WAT297S)	X	X		ATD24-T01N-SOL (SOL108)	X	X
Number SFW samples	6	6		ATD25-T01N-SOL (SOL108)	X	X
Number MS/D samples	1	1		ATD27-T01N-SOL (SOL108)	X	X
Number Field Duplicates	1	1		ATD36B-T02N-SOL (SOL106)	X	X
Number Rinsate Blanks*	1	1		ATD40C-T01N-SOL (SOL104)	X	X
GROUNDWATER				ATD41-T01N-SOL (SOL103)	X	X
DOUGLASWELL-T01N-GRW (WAT298A)	X	X		ATD42-1-T01N-SOL (SOL103)	X	X
HUNT-T01N-GRW (WAT299C)	X	X		ATD42-2-T01N-SOL (SOL103)	X	X
LS1-T01N-GRW (WAT299C)	X	X		ATD42-3-T01N-SOL (SOL103)	X	X
LS2-T01N-GRW (WAT299C)	X	X		ATD42-4-T01N-SOL (SOL103)	X	X
LS3-T01N-GRW (WAT299C)	X	X		ATD42-5-T01N-SOL (SOL103)	X	X
MMW-50A-T01N-GRW (WAT298A)	X	X		ATD42-6-T01N-SOL (SOL103)	X	X
P-2-T01N-GRW (WAT299C)	X	X		ATD42-7-T01N-SOL (SOL103)	X	X
PR-3-T01N-GRW (WAT299C)	X	X		ATD42-8-T01N-SOL (SOL103)	X	X
PR-4-T01N-GRW (WAT299C)	X	X		ATD43-T01N-SOL (SOL105)	X	X
PR-5-T01N-GRW (WAT299C)	X	X		ATD44-T01N-SOL (SOL107)	X	X
SPRING13-P1-T01N-GRW (WAT298A)	X	X		ATD45A-T01N-SOL (SOL107)	X	X
SPRING13-T01N-GRW (WAT298A)	X, FD	X, FD		ATD46A-T01N-SOL (SOL108)	X	X
US-1-T01N-GRW (WAT299C)	X	X		ATD46B-T01N-SOL (SOL104)	X	X
Number GRW samples	13	13		ATD4-T01N-SOL (SOL108)	X	X
Number MS/D samples	2[1]	2[1]		ATD50A-T01N-SOL (SOL107)	X	X
Number Field Duplicates	1	1		ATD7-T01N-SOL (SOL108)	X	X
Number Rinsate Blanks*	1	1		ATD8-1-T01N-SOL (SOL107)	X	X

Table 1-1
Summary of Samples Collected May 2004
Historic Tailings Spill Investigation and Hunts Pond Sampling Event

Sample Identification (SDG)	Total Metals	Inorganics		Sample Identification (SDG)	Total Metals	Inorganics
SOIL CONTINUED				STD42-8-T01N-SOL (SOL103)	X	X
ATD46A-T01N-SOL (SOL108)	X	X		STD43-T01N-SOL (SOL104)	X	X
ATD46B-T01N-SOL (SOL104)	X	X		STD44-T01N-SOL (SOL104)	X, MS/D[2]	X
ATD4-T01N-SOL (SOL108)	X	X		STD45A-T01N-SOL (SOL104)	X	X
ATD50A-T01N-SOL (SOL107)	X	X		STD46A-T01N-SOL (SOL104)	X	X
ATD7-T01N-SOL(SOL108)	X	X		STD46B-T01N-SOL (SOL104)	X	X
ATD8-1-T01N-SOL (SOL105)	X	X		STD4-T01N-SOL (SOL108)	X	X
ATD8-2-T01N-SOL (SOL105)	X	X		STD50A-T01N-SOL (SOL108)	X	X
ATD8-3-T01N-SOL (SOL105)	X, FD, MS/D	X, FD, MS/D		STD7-T01N-SOL (SOL108)	X	X
ATD8-4-T01N-SOL (SOL104)	X	X		STD8-1-T01N-SOL (SOL107)	X	X
ATD8-5-T01N-SOL (SOL104)	X, MS/D[2]	X		STD8-2-T01N-SOL (SOL104)	X	X
ATD8-6-T01N-SOL (SOL104)	X	X		STD8-3-T01N-SOL (SOL104)	X	X
ATD8-7-T01N-SOL (SOL105)	X	X		STD8-4-T01N-SOL (SOL107)	X	X
ATD8-8-T01N-SOL (SOL107)	X	X		STD8-5-T01N-SOL (SOL105)	X	X
GD-1-T02N-SOL (SOL106)	X, FD	X, FD		STD8-6-T01N-SOL (SOL107)	X, FD, MS/D	X, FD, MS/D
GD-2-T02N-SOL (SOL106)	X	X		STD8-7-T01N-SOL (SOL105)	X	X
HUNT1-T01N-SOL (SOL109)	X	X		STD8-8-T01N-SOL (SOL107)	X	X
HUNT2-T01N-SOL (SOL109)	X	X		TB50A-T01N-SOL (SOL107)	X	X
HUNT3-T01N-SOL (SOL109)	X, FD, MS/D	X, FD, MS/D		TD11C-T01N-SOL (SOL108)	X	X
HUNT4-T01N-SOL (SOL109)	X	X		TD14-T01N-SOL (SOL105)	X	X
PR3-1-T01N-SOL (SOL106)	X	X		TD16-T01N-SOL (SOL107)	X	X
PR3-2-T01N-SOL (SOL106)	X	X		TD19-T01N-SOL (SOL107)	X	X
PR4-1-T01N-SOL (SOL106)	X	X		TD1-T01N-SOL (SOL107)	X, FD, MS/D	X, FD, MS/D
PR4-2-T01N-SOL (SOL106)	X	X		TD25-T01N-SOL (SOL108)	X	X
PR5-1-T01N-SOL (SOL106)	X, FD	X, FD		TD27-T01N-SOL (SOL108)	X	X
PR5-2-T01N-SOL (SOL106)	X	X		TD36B-T01N-SOL (SOL106)	X	X
PR5-3-T01N-SOL (SOL106)	X	X		TD40C-T01N-SOL (SOL104)	X	X
PR5-4-T01N-SOL (SOL106)	X	X		TD43-T01N-SOL (SOL104)	X	X
PR5-5-T01N-SOL (SOL106)	X	X		TD44-T01N-SOL (SOL104)	X	X
PR5-6-T01N-SOL (SOL106)	X	X		TD45A-T01N-SOL (SOL104)	X	X
PR5-7-T01N-SOL (SOL106)	X	X		TD46A-T01N-SOL (SOL104)	X	X
STD11C-T01N-SOL (SOL108)	X	X		TD46B-T01N-SOL (SOL104)	X	X
STD19-T01N-SOL (SOL105)	X	X		TD4-T01N-SOL (SOL108)	X	X
STD1-T01N-SOL (SOL107)	X	X		TD7-T01N-SOL (SOL108)	X	X
STD24-T01N-SOL (SOL106)	X	X		TD8-1-T01N-SOL (SOL105)	X	X
STD25-T01N-SOL (SOL108)	X	X		TD8-2-T01N-SOL (SOL104)	X	X
STD27-T01N-SOL (SOL108)	X	X		TD8-3-T01N-SOL (SOL105)	X	X
STD36B-T01N-SOL (SOL106)	X	X		TD8-4-T01N-SOL (SOL105)	X	X
STD40C-T01N-SOL (SOL104)	X	X		TD8-5-T01N-SOL (SOL105)	X	X
STD41-T01N-SOL (SOL103)	X	X		TD8-6-T01N-SOL (SOL107)	X, FD, MS/D	X, FD, MS/D
STD42-1-T01N-SOL (SOL103)	X	X		TD8-7-T01N-SOL (SOL105)	X	X
STD42-2-T01N-SOL (SOL103)	X, FD, MS/D	X, FD, MS/D		TD8-8-T01N-SOL (SOL107)	X	X
STD42-3-T01N-SOL (SOL103)	X	X		Number SOIL samples	115	115
STD42-4-T01N-SOL (SOL103)	X	X		Number MS/MSD or MS/LD	6	6
STD42-5-T01N-SOL (SOL103)	X	X		Number Field Duplicates	6	6
STD42-6-T01N-SOL (SOL103)	X	X		Number Rinsate Blanks*	7[2]	7[2]
STD42-7-T01N-SOL (SOL103)	X	X				

Table 1-1
Summary of Samples Collected May 2004
Historic Tailings Spill Investigation and Hunts Pond Sampling Event

Sample Identification (SDG)	Total Metals	Inorganics
SEDIMENT		
GD-3-T02N-SED (SOL109)	X	X
HUNT1-T02N-SED (SOL109)	X, FD, MS/D	X, FD, MS/D
HUNT2-T02N-SED (SOL109)	X	X
HUNT3-T02N-SED (SOL109)	FD	FD
SD-2-T02N-SED (SOL108)	X	X
SD-3-T02N-SED (SOL108)	X	X
TD24-T01N-SED (SOL108)	X	X
UD-1-T02N-SED (SOL109)	X	X
Number Sediment samples	8	8
Number MS/S samples	1	1
Number Field Duplicates	2	2
Number Rinsate Blanks*	1	1
LEACHATE		
TD7-T01N-SOL (LF #2) (SPLP02)	X	X
TD7-T01N-SOL (LF #3) (SPLP02)	X	X
TD4-T01N-SOL (LF#2) (SOL108)	X	X
TD4-T01N-SOL (LF#3) (SOL108)	X	X
TD8T01N-SOL (LF#2) (SPLP02)	X	X
TD8T01N-SOL (LF#3) (SPLP02)	X	X
Number LEACHATE samples	6	6
Number MS/D samples	---	---
Number Field Duplicates	---	---
Number Rinsate Blanks*	---	---

Notes
IRW= Irrigation Water SFW = Surface Water GRW = Groundwater
SOL= Soil SED= Sediment MS/D= Matrix Spike/Laboratory Duplicate
RB = Rinsate Blank FD = Field Duplicate

[1]Two groundwater matrix spike samples were analyzed for the South of Tailings sampling event. As no matrix spike samples were analyzed on samples collected for the Historic Tailings Spill Investigation/Hunts Pond Investigation, matrix specific data results were associated with the groundwater samples in this collective assessment.

[2]Matrix spike samples were analyzed for phosphorus only.

*It could not be determined which samples immediately preceded the rinsate blank samples.

The data review process evaluated sample-specific and laboratory performance criteria in accordance with the standard operating procedure (SOP) 12.1. As mentioned in the SOP, all RI/FS data generated for the Questa Mine received an evaluation of sample-specific parameters. In addition, 10% of the data packages (per analysis type per event/episode) were reviewed for laboratory performance parameters. The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP12.1, was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), laboratory historical ranges determined acceptance ranges.

Sample-specific reviews evaluated the following sample related parameters:

- Case narrative comments
- Chain-of-Custody/Sample Receipt
- Holding Times
- Method Blank (Preparation Blank)
- Matrix-Dependent Quality Control
  - Matrix Spike Analysis
  - Laboratory duplicate Analysis
- Method-Specific Quality Control Measures
  - Inorganic Method Specific QC Measures
    - -- Post Digestion Spike Analysis
    - -- ICP Serial Dilution Tests
    - -- Internal Standard Performance
    - -- Cation/Anion Balance Evaluation
- Total vs. Partial Balance
- Field quality control samples
  - Field Duplicate Agreement
  - Rinsate Blank Results

Evaluation of laboratory performance parameters provided an overall representation of the analytical system at the time the samples were analyzed. The laboratory performance review evaluated parameters in control of the laboratory, but independent of the field samples analyzed, as follows:

- Interference Check Standard
- Laboratory Control Sample

If any potential systematic problems were determined upon review of the laboratory performance parameters in any of the selected packages evaluated (meeting the 10% criteria), the review parameter was evaluated in all other matrix specific samples for this sampling event to determine the need for data qualification. Instances, in which professional judgment was exercised in evaluating the need for data qualification, the basis for this rationale was provided in the data review summary.

Upon completion of the sample-specific reviews and laboratory performance reviews, a collective assessment for the event was performed. Site-specific matrix spike, laboratory duplicate, serial dilution, blank (field and rinsate, when applicable), and field duplicate results were assessed collectively by matrix per event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered more representative of the site sample matrix and a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 3.0 describes sample specific data review findings and several data quality issues affecting all of the sediment packages. Section 4.0 presents the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Section 5.0 summarizes the collective summary of the field QC results (field and rinsate blanks, when applicable, and field duplicate results) and the resultant sample qualification. Lastly, an overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for data packages WAT297S through WAT299C, SOL103 through SOL109, and SPLP02 for a total of eleven original data packages. In order to attain the frequency requirements for laboratory performance reviews for each matrix type, a total of five data packages (WAT297S, WAT298A, WAT299C, SOL109, and SPLP02) were evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identify whether any findings globally affect all relevant sediment samples analyzed for the May 2004 Historic Tailing Spill Investigation and Hunts Pond Sampling Event. Although most of these issues have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

3.2.1 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked metals. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.2 Laboratory Performance Review (LPR) Findings

As mentioned previously, five data packages were given full validation to assess the performance of the laboratory for all analyses. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated for all packages for this event included:

- Metals: Interference Check Sample Results
- All Parameters: Laboratory Control Sample

Inorganic parameter matrix QC consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. The site-specific matrix QC results were assessed collectively for each matrix type for the Historic Tailings Spill Investigation and Hunts Pond Sampling Event to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.3 present the collective matrix QC results associated with the samples in this event and the resultant data qualifiers.

One surface water, two groundwater, one sediment, and eight soil field samples were designated for both total/dissolved metals, and inorganics matrix spike analyses, as summarized in Table 4-1. Table 4-2 summarizes the breakdown of frequency requirements for each of the analyses for the May 2004 Historic Tailing Spill Investigation and Hunts Pond Sampling Event.

Table 4-1
Field Samples Designated for Matrix QC Analysis
Historic Tailings Spill Investigation and Hunts Pond Sampling Event

Sample ID	Analyses	
	Total Metals	Inorganics
SURFACE WATER		
HUNT1-T01N/D01N-SFW (WAT297S)	X	X
GROUNDWATER		
DP-14-T01N/D01N-GRW (WAT295C)	X	X
US-2-T01N/D01N-GRW (WAT296 C)	X	X
SEDIMENT		
HUNT1-T02N/T02D-SED (SOL109)	X	X
SOIL		
ATD8-3-T01N-SOL (SOL105)	X	X
ATD8-5-T01N-SOL (SOL104)	---	X*
HUNT3-T01N-SOL (SOL109)	X	X
STD42-2-T01N-SOL (SOL103)	X	X
STD44-T01N-SOL (SOL104)	---	X*
STD8-6-T01N-SOL (SOL107)	X	X
TD1-T01N-SOL (SOL107)	X	X
TD8-6-T01N-SOL (SOL107)	X	X

X* = Matrix spike analyses on samples ATD8-5-T01N-SOL and STD44-T01N-SOL were for Total Phosphorus.

Table 4-2
Frequency Requirements for Matrix QC
Historic Tailings Spill Investigation and Hunts Pond Sampling Event

Analyses	# MS Samples	Total # Samples	Percentage (%)
GROUNDWATER			
Total Metals	2	28*	7.1
Inorganics	2	28*	7.1
SURFACE WATER			
Total Metals	1	12	8.3
Inorganics	1	12	8.3
SEDIMENT			
Total Metals	1	8	12.5
Inorganics	1	8	12.5
SOIL			
Total Metals	6	115	5.2
Inorganics	6	115	5.2

*Cumulative number of groundwater samples for May 2004

As shown on the table above, the QAPP frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses and matrix type.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Collective Summary/Assessment of Matrix QC, Site-specific MS results, Laboratory Duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analyses, LD analyses, and the serial dilution results with the samples collected during the sampling eve

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results.

In general, qualification was limited to the parent sample if less than a quarter of the applicable matrix spike recoveries were outside the acceptance range. Conversely, if more than a quarter of the applicable matrix spike recoveries were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average matrix spike recovery, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

Surface Water

As all surface water samples for this event were analyzed in one data package (WAT297S), matrix spike qualifications were limited to the sample specific review, (refer to Attachment 1.1). To summarize, the ammonia result for parent sample HUNT-T01N-SFW was qualified as estimated (J MS-L), as a matrix spike recovery of 67% was reported.

Groundwater

None of the groundwater samples collected for the Tailing Spill Investigation and Hunts Pond Sampling event were assigned for matrix QC analyses. However, as two matrix spike samples were collected for the South of Tailings Sampling Event for May 2004, any overall qualifications as a result of these samples were extended to the 13 groundwater samples in this event. The matrix spike analyses of the two samples for the South of Tailings Sampling event (DP-14-T01N-GRW and US-2-T01N-GRW) resulted in the recovery of one analyte outside of acceptance criteria. Iron was recovered in sample US-2-T01N-GRW at 130.4%. A potential high bias, associated with a nondetect iron result did not result in qualification. As all iron results for the groundwater samples collected in May of 2004 were nondetect, no qualification of sample results were issued due to matrix spike recoveries.

Sediment

One matrix spike sample (HUNT1-T02N-SED) was associated with the eight sediment samples analyzed with this sampling event. Qualification was limited to the parent sample only for antimony (UJ MS-L), as poor matrix spike recoveries for antimony was expected (as previously described) and the percent recovery was greater than 30%. All sediment phosphorus results were qualified as estimated (J MS-L) due to the low matrix spike recovery (28%).

Soil

A number of MS recoveries were outside of the acceptance limits of 75-125% for both inorganics and metals in soil samples. Tables 4-3 and 4-4 summarize the inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 4-3
Soil Inorganics Matrix Spike Results

Analyte	Number of Valid Spikes/ Total Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
Chloride	6	0	0	95.8	NQ
Sulfate	6	2	0	83.0	Parent sample results only qualified (J MS-L)
Nitrate as N	6	0	1	103.7	Parent sample result only qualified (NQ (ND))
Fluoride	6	0	0	91.8	NQ
Ammonia	6	1	0	81.0	Parent sample result only qualified (J MS-L)
TKN	5	0	2	123.0	Parent sample results only qualified (J MS-H)
Phosphorus as P	6	4	1	67.7	J/UJ MS-I sample results
TOC	6	0	0	94.0	NQ

NQ = No Qualification
NQ (ND) = No qualification for nondetect results associated with a potential high bias

Sulfate, nitrate as N, ammonia, and TKN were qualified in the parent and duplicate samples. Results for phosphorus in all soil samples were qualified as estimated (J/UJ MS-I), due to the fact that five out of six matrix recoveries were outside of the acceptance range, one in excess of 125%, the remaining four below 75%. In general, the table indicates the accuracy of the

analyses relative to the site-specific soil matrix was acceptable as all average recoveries were within limits, with the exception of phosphorus.

Table 4-4
Soil Metals Matrix Spike Results

Analyte	Total				Action
	# Valid	#R <75%	#R > 125%	Avg %R	
Aluminum	0	0	0	---	NQ
Antimony	6	6	0	28.5	All sample results J/UJ MS-L
Arsenic	6	0	0	88.7	NQ
Barium	0	0	0	91.9	NQ
Beryllium	6	0	0	98.3	NQ
Boron	6	0	0	85.6	NQ
Cadmium	6	0	0	91.1	NQ
Chromium	6	0	0	94.3	NQ
Cobalt	6	0	0	91.3	NQ
Copper	4	0	0	110.6	NQ
Iron	0	0	0	---	NQ
Lead	0	0	0	---	NQ
Manganese	0	0	0	---	NQ
Mercury	6	0	0	111.1	NQ
Molybdenum	5	1	0	92.7	Parent sample results only qualified (J MS-L)
Selenium	6	0	4	141.3	J MS-H positive sample results, ND (NQ)*
Nickel	6	0	0	92.1	NQ
Thallium	6	0	0	104.0	NQ
Silver	6	0	0	94.9	NQ
Vanadium	6	0	0	95.2	NQ
Zinc	5	0	0	97.6	NQ

ND (NQ) = No qualification for nondetect results associated with a potential high bias
*With the exception of those samples which reported acceptable matrix spike recoveries.

As indicated in the table, the accuracy of the analyses relative to the site-specific matrix was acceptable, as all matrix spike recoveries for all metal analytes, with the exception of antimony, molybdenum, and selenium, reported acceptable recoveries. As all six antimony matrix spike recoveries were below the lower limit, qualification was extended to all antimony results. Exercising professional judgment, it was not considered necessary to reject nondetect antimony results despite the average matrix spike recovery of 28.5% being less than 30%. At project on-set, it was known that the digestion was not effective for antimony. However, a separate digestion was not deemed necessary because antimony is not considered to be a site-related contaminant. As such, the low antimony recoveries were not unexpected and the antimony data are considered usable in meeting project objectives in spike of the potential low bias. As only one matrix spike recovery for molybdenum was outside of the acceptance range and the average percent recovery was well within the range, qualification was limited to the parent sample only. In the case of selenium, four of six results were reported in excess of the acceptance range, and accordingly resulted in qualification of all detected selenium results as estimated, whereas nondetect results with a high bias did not warrant qualification.

Post-Digestion Spikes

Post-digestion spikes were conducted on all ICP and ICP/MS analytes to determine whether matrix recoveries outside of the acceptance range were the result of sample matrix, or due to a bias in the analytical system. The post digestion recoveries for those analytes that did not meet the specified criterion for the initial matrix spike recoveries were reviewed. As the reviewed post matrix spike recoveries were all within the range of 75-125%, no qualification on the basis of post-digestion spike recoveries were necessary. It was likely that all matrix spike exceedances were due to a matrix effect on digestion rather than a bias in the analytical system.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Laboratory duplicate sample results were evaluated to assess the precision of the laboratory analyses. The same samples as designated for matrix spike analyses were designated for metals and inorganic parameter laboratory duplicate analyses for each of the four matrix types. The evaluation criteria used are summarized in SOP 12.1. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

The RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within the QAPP acceptance limits for all laboratory duplicate analyses, with the exception of several inorganic results, as summarized in Table 4-5.

Table 4-5
Inorganic Laboratory Duplicate Results

Analyte	Sample ID	Criterion	Criterion Exceedances	Action
SURFACE WATER				
TSS	HUNT1-T01N-SFW (WAT297S)	|Diff| <1xRL	14.4 xRL	J/UJ D-I all sample results for TSS.
SEDIMENT				
Chloride	HUNT1-T02N-SED (SOL109)	RPD ≤35%	47 RPD	J/UJ D-I all sample results for chloride and lead.
Lead			64.2 RPD	
SOIL				
Sulfate	TD1-T01N-SOL (SOL107)	|Diff| <2xRL	2.8x RL	J/UJ D-I in parent results only.
Lead		RPD ≤35%	38.4 RPD	

Qualification was limited to the parent sample only for sulfate and lead in soil samples, as less than a quarter (1/6) of the laboratory duplicate results for each analyte exceeded acceptance limits. TSS results in surface water samples and chloride and lead results in sediment samples were qualified globally as estimated, with an indeterminate bias direction assigned. In these instances, the laboratory duplicate results for the only QC sample in the matrix was enough to represent the small number of samples for each of the matrices affected (1/6 for surface water and 1/8 for sediment samples). Based on the laboratory duplicate results, the overall level of precision demonstrated is considered to be acceptable.

4.3 ICP SERIAL DILUTION RESULTS

ICP serial dilutions were performed on metal samples in every data package. These analyses were run on the same samples as were designated for matrix QC analyses, or otherwise randomly selected in data packages in which there were no QC samples designated. These analyses were used to evaluate whether or not significant physical or chemical interferences existed due to sample matrix. This was accomplished by analyzing the sample and a five-fold dilution of the sample. The percent difference (%D) between these two concentrations was compared for those analytes for which the serial dilution analysis was applicable (i.e., the initial concentrations were sufficiently higher (50x) than the IDL, accounting for dilution).

Where exceedances were identified, the diluted result is generally considered more accurate as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result. Qualifications were generally limited to the parent samples if less than a quarter of the valid serial dilution results were outside of the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set, the average %D, and the magnitude of outages were also taken into consideration. The serial dilution analyses did not indicate a pervasive matrix analytical problem.

Surface Water

Surface water serial dilution results for two samples (HUNT1-T01N-SFW and HUNT-D01N-SFW) were reviewed, resulting in two of 24 analytes applicable to the study. The cadmium %D for sample HUNT-1-T01N-SFW was slightly above the criteria (10.1%) and rounds to 10%; thereby meeting acceptance criterion. No surface water data results were qualified at the level of sample specific review or collectively on the basis of serial dilution results.

Groundwater

Groundwater serial dilution results for two samples (MMW-50A-T01N-GRW and HUNT-T01N-GRW) were evaluated to determine whether a potential matrix analytical problem existed. As only one analyte for each serial dilution analysis was applicable to the study, a dilution effect could not be assessed for any other analytes. It is necessary that the initial concentration be sufficiently high enough (i.e. greater than 50x the IDL, adjusted for dilution) to compare concentration results against a percent difference criterion of 10%. It is for this reason, that serial dilution analyses are routinely evaluated using matrix spike samples. No groundwater data results were qualified at the level of sample specific review or collectively on the basis of serial dilution results.

Sediment

Sediment serial dilution results for one sample (HUNT1-T02N-SED) was reviewed, resulting in 13 or 24 analytes applicable to the study. The percent deviations between the original results and its 5-fold dilutions were compared to an evaluation criterion of ±10%. Both lead (14.5%) and potassium (14.2%) results in this parent sample were qualified as estimated (J DL-L). None of the sediment samples results for this event were qualified collectively on the basis of serial dilution results.

Soil

Soil serial dilution results for nine samples were reviewed. Table 4-6 summarizes each sample utilized for a serial dilution analysis, along with the associated applicable analytes, and the results exceeding the acceptance criterion of ≤10%D.

Table 4-6
Soil ICP Serial Dilution Results

Sample ID	Applicable Analytes (%D>10% in bold)
STD42-2-T01N-SOL (SOL103)	**Al (10.7)**, Ba, **Ca (11.5)**, **Cr (11.1)**, **Co (14.8),** Cu, **Fe (11.7), Pb (14.4), Mg (12.1), Mn (12.2), Mo (10.4), Ni (15.4), K (23.3),** V, **Zn (13.6)**
ATD8-6-T01N-SOL (SOL104)	Al, Ba, Ca, Cr, Cu, Fe, Pb, Mg, Mn, Mo, Ni, **K (11.9),** V, Zn
ATD8-3-T01N-SOL (SOL105)	Al, Ba, Ca, Cr, Cu, Fe, Pb, Mg, Mn, Mo, Ni, **K (14.7),** V, Zn
PR4-1-T01N-SOL (SOL106)	Al, Ba, Ca, Cr, Cu, Fe, **Pb (10.4),** Mg, Mn, **Mo (18.6), K (22)**, **Zn (12.8)**
STD8-6-T01N-SOL (SOL107)	Al, Ba, Ca, **Cr (11.9),** Cu, Fe, **Pb (11),** Mg, Mn, Mo, **Ni (17.4**), **K (11.3),** V, **Zn (20.6)**
TD8-6-T01N-SOL (SOL107)	Al, Ba, **Be (18.4), Ca (11.3), Cr (13.3),** Cu, **Fe (11.2), Pb (14.6), Mg (10.3), Mn (12.3),** Mo, **Ni (21.2), K (19.7),** V, **Zn (20)**
TD1-T01N-SOL (SOL107)	Al, Ba, **Be (19.9), Cd (14)Ca (12.3), Cr (13.7), Co (15.4),** Cu, **Fe (12.3), Pb (14.5), Mg (10.8),** Mn, **Mo (10.9), Ni (19), K (21.1),** V, **Zn (18.6)**
ATD46A-T01N-SOL (SOL108)	**Al (20.1), Ba (16.9), Ca (20.3), Cr (28), Cu (17.9), Fe (20.4), Pb (23.8), Mg (21.2), Mn (21.6), Ni (40.5), K (28.8), V (20), Zn (34.3)**
HUNT3-T01N-SOL (SOL109)	**Al, Ba, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K (18.1), V, Zn**

Where exceedances were identified, the diluted result is generally considered more accurate as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result. Qualifications were generally limited to the parent samples if less than a quarter of the valid serial dilution results were outside of the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set, the average %D, and the magnitude of outages were also taken into consideration.

Table 4-7 summarizes the average % Ds for each of the analytes, along with the percent of applicable analytes that exceeded control criteria (10%) for soil samples, and the resultant qualifiers based on the collective assessment.

Table 4-7
Soil ICP Serial Dilution Overall Assessment

Analyte	Total				Action
	# of Valid Results	%Ds >10%	% Valid Result >10%	Avg %D	
Aluminum	9	2	22.2	9.0	Parent samples only
Antimony	0	---	---	---	NQ
Arsenic	0	---	---	---	
Barium	9	1	11.1	6.7	Parent sample only
Beryllium	2	2	100	19.2	J/UJ DL-L all sample Be results
Boron	0	---	---	---	NQ

Table 4-7
Soil ICP Serial Dilution Overall Assessment

Analyte	Total				Action
	# of Valid Results	%Ds >10%	% Valid Result >10%	Avg %D	
Cadmium	1	1	100	14	Parent sample results qualified only for these analytes.
Calcium	9	4	44.4	10.0	
Chromium	9	5	55.6	10.5	
Cobalt	3	2	66.7	12.3	
Copper	9	1	11.1	5.9	
Iron	9	4	44.4	10.0	
Lead	9	6	66.7	12.8	
Magnesium	9	4	44.4	10.0	
Manganese	9	3	33.3	9.4	
Molybdenum	8	3	37.5	8.3	
Nickel	8	5	62.5	16.5	J/UJ DL-L all sample Ni results
Potassium	9	9	100	19.0	J/UJ DL-L all sample K results
Selenium	0	---	---	---	NQ
Silver	0	---	---	---	
Sodium	0	---	---	---	
Thallium	0	---	---	---	
Vanadium	8	1	12.5	8.3	Parent sample result qualified only.
Zinc	9	6	66.7	16.4	J/UJ DL-L all sample Zn results

NQ = No Qualification

Multiple analytes for the nine serial dilution samples were in excess of the 10% difference criterion. As the soil matrix is heterogeneous in nature, a criterion of 15% was utilized for the assessment of collective qualifications. The majority of the analytes were qualified in the parent samples only, as the average %Ds were <15%, as indicated in the table. Beryllium, nickel, potassium, and zinc results in all soil samples were qualified collectively as estimated, as 62.5-100% of the results were in excess of 10%, and the averages were in excess of 15%. A low potential bias was assigned to all qualifications, as all original results were less than the diluted results.

Site-specific field duplicate samples and rinsate blanks were assessed collectively by matrix for the May 2004 Historic Tailing Spill Investigation and Hunts Pond Sampling Event to determine the need for qualification of sample results of similar matrices. The sections to follow summarize the results for these QC samples and any collective qualifications arising from the assessments.

5.1 FIELD DUPLICATE AGREEMENT

The field duplicate agreement assessment evaluated the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, per matrix type, as follows. When both concentration results were sufficiently greater (5x) the RL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤35% for surface and groundwaters, and ≤50% for soil and sediment samples. If one or both of the concentration results were less than 5x the RL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤2x for surface and groundwaters, and ≤3.5x the RL for soil and sediment samples.

In general, qualification was limited to the parent sample if less than a quarter of the field duplicate results were outside the acceptance range. Conversely, if more than a quarter of the field duplicate results were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the magnitude of the exceedances (marginal vs. gross) and the complexity of the sample matrix.

Again, the frequency of the field duplicate samples followed the frequency of matrix spike and laboratory duplicate analyses, as the same samples were designated for all QC parameters. Table 5-1 summarizes the sample sites, which were duplicated and notated as field duplicate samples, per parameter. The breakdown of field duplicate pair samples per analysis and fraction can be referenced in Table 5-2.

Table 5-1
Summary of Field Duplicate Samples Collected May 2004 Historic Tailings Spill Investigation and Hunts Pond Sampling Event

Sample ID	Analyses	
	Total Metals	Inorganics
SURFACE WATER		
HUNT1-T01N/T01D-SFW (WAT297S)	X	X
HUNT1-D01N/D01D-SFW (WAT297S)	X	X
GROUNDWATER		
SPRING13-T01N/T01D-GRW (WAT298A)	X	X
SPRING13-D01N/D01D-GRW (WAT298A)	X	X
SEDIMENT		
HUNT3-T02N/T02D-SED (SOL109)	X	X
HUNT1-T02N/T02D-SED (SOL109)	X	X

Table 5-1
Summary of Field Duplicate Samples Collected May 2004
Historic Tailings Spill Investigation and Hunts Pond
Sampling Event

Sample ID	Analyses	
	Total Metals	Inorganics
SOIL		
STD42-2-T01N/T01D-SOL (SOL103)	X	X
ATD8-3-T01N/T01D-SOL (SOL105)	X	X
STD8-6-T01N/T01D-SOL (SOL107)	X	X
TD8-6-T01N/T01D-SOL (SOL107)	X	X
TD1-T01N/T01D-SOL (SOL107)	X	X
HUNT3-T01N/T01D-SOL (SOL109)	X	X

Table 5-2
Field Duplicate Collection Frequency
Historic Tailing Spill Investigation and Hunts Pond Sampling Event

Analyses	# FD Samples	Total # Samples	Percentage (%)
GROUNDWATER			
Total Metals	2	14	7.1
Inorganics	2	14	7.1
SURFACE WATER			
Total Metals	1	12	8.3
Inorganics	1	12	8.3
SEDIMENT			
Total Metals	2	8	25
Inorganics	2	8	25
SOIL			
Total Metals	6	115	5.2
Inorganics	6	115	5.2

The frequency requirement of 5% was met for all matrices analyzed during this sampling event.

All field duplicate samples assessed for the Historic Tailing Spill Investigation and Hunts Pond Sampling Event were within the criteria specified in SOP 12.1 for metals and inorganics, with the exception of the following. Table 5-3 summarizes the exceptions and resultant data qualifiers.

Table 5-3
Summary of Field Duplicate Sediment Sample Exceedances

Analyte	Sample ID	Criterion	Criterion Exceedances	Action
SURFACE WATER				
TSS	HUNT1-T01N/D-SFW (WAT297S)	|Diff| <2xRL	13.6xRL	J FD-I for affected field duplicate samples only
Chloride		RPD ≤35%	79.RPD	
Nitrate		|Diff| <2xRL	33xRL	
SOIL				
Sulfate	STD42-2-T01N/D-SOL (SOL103)	RPD ≤50%	113 RPD	Sulfate results qualified in all sample results (J/UJ FD-I)
Nitrate as N			65 RPD	J FD-I for affected field duplicate samples only
Conductivity	ATD8-3-T01N/D-SOL (SOL105)		66 RPD	
Chloride	TD1-T01N/D-SOL (SOL107)		250 RPD	
Sulfate	HUNT3-T01N/D-SOL (SOL109)		60 RPD	Sulfate results qualified in all sample results (J/UJ FD-I)
Phosphorus as P			98 RPD	J FD-I for affected field duplicate samples only
SEDIMENT				
Phosphorus as P	HUNT3-T02N/D-SOL (SOL109)	RPD ≤50%	113 RPD	Results qualified in all sample results (J/UJ FD-I)
TOC			137 RPD	
Sulfate	HUNT1-T02N/D-SOL (SOL109)		89 RPD	
TKN			114 RPD	
TOC			156 RPD	

With few exceptions, the applicable evaluation criterion was met for field duplicate assessments. Qualifications on the basis of field duplicate disagreement were issued to the parent duplicate pairs only for TSS, chloride, and nitrate in surface water samples, and nitrate, conductivity, chloride, and phosphorus in soil samples, due to the minimal frequency of the exceedances. Two field duplicate samples were associated with the eight sediment samples in this event. Due to the magnitude of the exceedances, phosphorus, TOC, sulfate, and TKN were qualified as estimated in all sediment sample results. Two of the six duplicate pairs for soil samples did not meet the field duplicate criterion for sulfate. As such, it was necessary to qualify all sulfate results in this event for field duplicate imbalances as estimated. Based on the field duplicate results, the overall level of precision demonstrated is considered to be acceptable for analytes. Analytes for which a level of uncertainty was demonstrated due to field duplicate disagreements were qualified accordingly.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blank samples are prepared by pouring ASTM (American Society of Testing and Materials) Type II reagent grade water over the sampling device, collecting the sample in a container, and transporting the sample to the laboratory for analysis. Table 5-4 summarizes the rinsate blank samples associated with the samples collected during the Historic Tailings Spill Investigation and Hunts Pond Sampling Event. The QAPP required frequency of 5% for the collection of rinsate blanks was met for this sampling event.

Table 5-4
Summary of Rinsate Blank Samples Collected May 2004
Historic Tailings Spill Investigation and Hunts Pond Sampling Event

Sample ID	Metals	Inorganics
GROUNDWATER		
RB01T/D-GRW (WAT296C)	X	X
Frequency:	16.7	16.7
SURFACE WATER		
RB01T/D-SFW (WAT297C)	X	X
Frequency:	7.7	7.7
SEDIMENT		
RB01T-SED (WAT296C)	X	X
Frequency:	12.5	12.5
SOIL		
RB01T-SOL (WAT296C)	X	X
RB02T-SOL (WAT296C)	X	X
RB03T-SOL (WAT296C)	X	X
RB04T-SOL (WAT296C)	X	X
RB05T-SOL (WAT296C)	X	X
RB06T-SOL (WAT296C)	X	X
RB07T-SOL (WAT296C)	X*	---
Frequency:	5.2	5.2

*Analyzed for cyanide only.

Table 5-5 summarizes the analytes detected in the associated RI/FS rinsate blank samples for groundwater and surface waters. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. No sediment or soil sample required qualification based on rinsate blank evaluation. As such, the table lists only the analytes for which qualification was considered. A conservative approach for calculating equivalent concentrations was undertaken. This was based on the assumption that all contamination found in the blank aliquot analyzed would also be present in the sample aliquot analyzed. An average percent solids of 90% for soils and 73% for sediments was used for these calculations.

Evaluation of the range of detected concentrations for each analyte reported in the rinsate blank samples provided an indication of the reasonable maximum likely contribution for each of these analytes. None of the reported rinsate blank contaminants were at high enough concentrations that qualification of these analytes in sample results as nondetect was considered. In addition, considering the different environmental and rinsate blank preparation procedures, the maximum likely contributions for the detected analytes would be minimal.

Table 5-5
Summary of Rinsate Blank Results and Additional Qualifications

Analytes	RL	# Detections	Total # Samples	% Detections	Average Conc. (mg/L)	x5 Criteria (mg/L)	Range for Field Samples (mg/L)	Action
GROUNDWATER- TOTAL FRACTION								
Total Dissolved Solids (TDS)	5.0	1	1	100	18	90	82-1040	TDS results ≤ 90→U RB-I
Bicarbonate Alkalinity (Balk)	1.0	1	1	100	2.8	14	1.0-1.9	Balk, TAlk results ≤ 14→ U RB-I
Total Alkalinity (Talk)	1.0	1	1	100	2.8	14		
Ammonia	0.040	1	1	100	0.16	0.8	0.043-0.098	Ammonia result ≤ 0.8→U RB-I
Molybdenum (T)	0.50	1	1	100	1.6	8	1.4-36.2	Total molybdenum results ≤ 8→ U RB-I
SURFACE WATER- TOTAL FRACTION								
Total Suspended Solids (TSS)	5.0	1	1	100	1	5	1.6-21	TSS results ≤5 → U RB-I
Bicarbonate Alkalinity (BAlk)	1.0	1	1	100	3	15	1.0-51	All BAlk, TAlk results either nondetect or in excess of criterion, NQ
Total Alkalinity (TAlk)	1.0	1	1	100	3	15	1.0-51	
Ammonia	0.040	1	1	100	0.062	0.31	0.040-0.098	Ammonia results ≤0.31 → U RB-I

NQ = No Qualification

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results less than the calculated criteria concentration. In determining the average concentrations, for nondetect values, one half the RL was used to represent the contributing concentration, as opposed to zero, which could potentially bias the average concentration low. Despite the fact that some results were qualified as nondetect on the basis of rinsate blank detections, the rinsate blank results are generally indicative of acceptable decontamination procedures as detections were infrequent and at low levels.

All data were considered acceptable for use in meeting project objectives as qualified. Multiple sample results were qualified as nondetect on the basis of contamination identified in the laboratory blanks. Others were qualified as estimated on the basis of matrix spike results. Lastly, several data results were qualified as estimated on the basis of holding time exceedances, serial dilution results, or laboratory/field duplicate disagreements. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment for May 2004
Historic Tailings Spill Investigation and Hunts Pond Sampling Event

Analysis Type	QC Measure	# of Measurements	# Within Criteria	% Results within Criteria
SURFACE WATER				
Inorganics	FD	22	19	86
	LD	22	21	95
Metals (T, D)	FD	51	51	100
	LD	51	51	100
GROUNDWATER				
Inorganics	FD	20	20	100
	LD	40	40	100
Metals (T, D)	FD	102	102	100
	LD	102	102	100
SOIL				
Inorganics	FD	78	72	92
	LD	78	76	97
Metals (T, D)	FD	150	150	100
	LD	150	150	100
SEDIMENT				
Inorganics	FD	26	21	81
	LD	13	11	85
Metals (T, D)	FD	50	50	100
	LD	25	25	100

The percentage of acceptable precision measurements ranged from 81% to 100% for all parameters. The overall level of precision demonstrated for all analyses collectively was considered to be acceptable.

6.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Percent of MS (and MSD) recoveries meeting criteria are summarized in Table 6-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters.

Table 6-2
Summary of Accuracy Assessment for May 2004
Historic Tailing Spill Investigation and Hunts Pond Sampling Event

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
GROUNDWATER				
Inorganics	MS	22	22	100
Metals	MS	64	63	98
SURFACE WATER				
Inorganics	MS	13	12	92
Metals	MS	43	43	100
SOIL				
Inorganics	MS	47	38	81
Metals	MS	98	87	88
SEDIMENT				
Inorganics	MS	8	7	87
Metals	MS	17	16	94

The percentage of acceptable accuracy measurements ranged from 81% to 100%. The overall level of accuracy with respect to the site matrix demonstrated for all analyses collectively was considered to be acceptable.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results were considered usable as qualified for meeting project objectives. The QAPP completeness goal of 80% was met.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the samples collected during the May 2004 Historic Tailings Spill Investigation and Hunts Pond Sampling Event. As relatively few data results were qualified on the basis of field duplicate disagreement, the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 5.2 indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analytes. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit requirements for all metals. While it is anticipated that all non-rejected data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT297S

Sampling Events: Supplemental Sampling South of Tailings and Hunts Pond

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Jennifer Winnike

Date Completed: 06/17/04

Peer Reviewer: Stacey Coker

Date Completed: 06/28/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics
LR6-T01N-SFW	SA	570404		W	X	X
LR6-D01N-SFW	SA	570405		W	X	
LR4-T01N-SFW	SA	570406		W	X	X
LR4-D01N-SFW	SA	570407		W	X	
LR-4U-T01N-SFW	SA	570408		W	X	X
LR-4U-D01N-SFW	SA	570409		W	X	
GARDEN1-T01N-IRW	SA	570410		W	X	X
GARDEN1-D01N-IRW	SA	570411		W	X	
HUNT2-T01N-SFW	SA	571230		W	X	X
HUNT2-D01N-SFW	SA	571231		W	X	
HUNT1-T01N-SFW	SA,MS, LD	571232		W	X	X
HUNT1-D01N-SFW	SA,MS LD	571233		W	X	
HUNT1-T01D-SFW	FD	571234		W	X	X
HUNT1-D01D-SFW	FD	571235		W	X	
RB01T-SFW	RB	571236		W	X	X
RB01D-SFW	RB	571237		W	X	

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate MS = Matrix Spike LD = Laboratory Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory case narrative indicated that the bottles for cyanide analysis were received at a reduced pH despite field pH checks that indicated the pH was ≥ 12. As such, the laboratory added NaOH pellets to cyanide samples LR6-T01N-SFW, LR4-T01N-SFW, LR-4U-T01N-SFW and GARDEN1-T01N-IRW. However, the cyanide results for these samples were qualified as estimated (**J P-I**) because the pH upon receipt was not correct.
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 9-14 days after sampling and 7-12 days beyond log-in. The pH for the same samples were measured approximately 2-3 days beyond sampling. Therefore, all conductivity and pH results were qualified as estimated (**J/UJ**). The BOD analyses were analyzed 1 day beyond holding time. Therefore all BOD results were qualified as estimated (**J/UJ**). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Chloride was detected in the method blank run on 05/08/04. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD HUNT1-T01N-SFWMS HUNT1-D01N-SFWMS • LD HUNT1-T01N-SFWD HUNT1-D01N-SFWD	No	The RPD between the laboratory duplicate results was outside the applicable evaluation criterion (absolute difference was 14.4 x RL) for TSS in sample HUNT1-T01N-SFW. The TSS result for sample HUNT1-T01N-SFW was qualified as estimated (**J D-I**). For matrix spike sample HUNT1-T01N-SFW, the ammonia recovery was below evaluation criteria (67%). Therefore, the ammonia result for sample HUNT1-T01N-SFW was qualified as estimated (**J MS-L**). The matrix quality control results for the Supplemental Sampling South of Tailings and Hunts Pond sampling events will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution HUNT1-T01N-SFWSL HUNT1-D01N-SFWSL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses run on the matrix spikes of samples HUNT1-T01N-SFW and HUNT1-D01N-SFW were applicable for only 22 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. The cadmium result for sample HUNT1-T01N-SFW was slightly above criteria (10.1%). Since the percent difference rounds to 10%, no qualifications of data were necessary. The serial dilution results for the Supplemental Sampling South of Tailings and Hunts Pond sampling events will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion, with the exception of rinsate blank sample RB01*-SFW, which reported a cation/ anion % difference of -73.87%. As the concentrations were low enough that the reporting limits controlled the calculations, the cation/anion % difference was not considered representative of this comparison and therefore did not result in data qualification. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate HUNT1-T01D-SFW HUNT1-D01D-SFW • Rinsate Blank RB01T-SFW RB01D-SFW	Yes	All field duplicate results were within evaluation criteria except for the RPDs between the TSS, chloride and nitrate results for samples HUNT1-T01N-SFW and HUNT1-T01D-SFW. Table 1.3 summarizes the outlying field duplicate results and the resultant data qualifications. The field QC results for the Supplemental Sampling South of Tailings and Hunts Pond sampling events will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	N/A	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.

Review Parameter	Criteria Met?	Comments
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The IDL initially reported for molybdenum was 0.00 µg/L. The laboratory was contacted for an explanation. Upon investigation, the laboratory discovered that the molybdenum results initially reported were quantitated based on the wrong isotope, which is why the IDL registered as 0.00 on the Form. The laboratory submitted revised reporting forms (i.e. Form 1s) with molybdenum results which were quantitated using the proper isotope. The revised data sheets were collated into the data package. A revised IDL summary form and EDD were also submitted.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. Acceptable performance is inferred from ongoing acceptable QC sample results.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Cond. (µmhos/cm)	pH (std units)	BOD
LR6-T01N-SFW	949 J	7.8 J	1.4 UJ
LR4-T01N-SFW	387 J	8.1 J	1.4 UJ
LR-4U-T01N-SFW	465 J	8.0 J	1.4 UJ
GARDEN1-T01N-IRW	172 J	8.4 J	1.4 UJ
HUNT2-T01N-SFW	366 J	7.1 J	1.8 J
HUNT1-T01N-SFW	372 J	7.2 J	1.4 J
HUNT1-T01D-SFW	386 J	7.1 J	1.3 UJ
RB01T-SFW	5.0 UJ	6.7 J	1.3 UJ

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Chloride	---	---	---	---	0.25	0.20	RB01T-SFW	U MB-I
Antimony DF=1	0.5	0.5	0.5	0.5	0.453	0.4	GARDEN1-D01N-IRW GARDEN1-T01N-IRW HUNT1-D01D-SFW HUNT1-D01N-SFW HUNT1-T01D-SFW HUNT2-D01N-SFW HUNT2-T01N-SFW LR4-D01N-SFW LR4-T01N-SFW LR-4U-D01N-SFW LR-4U-T01N-SFW LR6-D01N-SFW LR6-T01N-SFW RB01D-SFW	U MB,CCB-I
Aluminum DF=1	69.8	51.7	52.9	58.7	41.420	17.6	GARDEN1-D01N-IRW	U CCB-I
							HUNT1-D01D-SFW HUNT1-D01N-SFW HUNT1-T01D-SFW HUNT1-T01N-SFW HUNT2-D01N-SFW HUNT2-T01N-SFW LR4-D01N-SFW LR-4U-D01N-SFW LR-4U-T01N-SFW LR6-D01N-SFW LR6-T01N-SFW RB01D-SFW RB01T-SFW	U MB,CCB-I
Beryllium DF=1	-0.3	---	---	---	---	0.2	GARDEN1-D01N-IRW GARDEN1-T01N-IRW LR4-D01N-SFW LR4-T01N-SFW LR-4U-D01N-SFW LR-4U-T01N-SFW LR6-D01N-SFW LR6-T01N-SFW	UJ CCB-L
Boron DF=1	---	---	---	---	1.993	1.8	GARDEN1-D01N-IRW GARDEN1-T01N-IRW HUNT1-D01D-SFW HUNT1-D01N-SFW HUNT1-T01D-SFW HUNT1-T01N-SFW HUNT2-D01N-SFW HUNT2-T01N-SFW	U MB-I
Chromium DF=1	---	---	---	-1.0	---	0.8	HUNT1-T01D-SFW HUNT1-D01D-SFW RB01D-SFW	UJ CCB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Iron DF=1	---	21.2	26.0	---	---	19.2	GARDEN1-D01N-IRW HUNT1-T01D-SFW HUNT1-T01N-SFW HUNT2-D01N-SFW HUNT2-T01N-SFW LR4-D01N-SFW LR-4U-D01N-SFW LR6-D01N-SFW LR6-T01N-SFW	U CCB-I
Manganese DF=1	---	---	---	---	3.639	1.9	GARDEN1-D01N-IRW HUNT1-D01D-SFW HUNT1-D01N-SFW HUNT1-T01D-SFW HUNT1-T01N-SFW HUNT2-D01N-SFW HUNT2-T01N-SFW	U MB-I
Molybdenum DF=1	0.6	0.4	0.4	0.4	0.394	0.3	GARDEN1-D01N-IRW	U CCB-I
							RB01D-SFW RB01T-SFW	U MB, CCB-I
Zinc DF=1	---	---	---	---	3.229	1.5	GARDEN1-D01N-IRW LR4-D01N-SFW LR4-T01N-SFW LR-4U-D01N-SFW LR-4U-T01N-SFW LR6-D01N-SFW LR6-T01N-SFW RB01D-SFW	U MB-I

CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Field Duplicate Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	RL (mg/L)	FD Results		Criteria*	Qualification Code
		HUNT1-T01N-SFW	HUNT1-T01D-SFW		
TSS	0.5	9.1	2.3	13.6 x RL	J FD-I For parent sample and duplicate
Chloride	0.2	4.7	10.9	RPD= 79.5%	J FD-I For parent sample and duplicate
Nitrate	0.2	0.20 U	8.6	33 x RL	J FD-I For parent sample and duplicate

RL = Reporting Limit AD = Absolute Difference

*Criteria: RPD ≤ 30% (when both sample results >5xCRDL), or AD ≤ 2xCRDL (when one or both sample results <5xCRDL)

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT298A Sampling Event: May 2004 GRW

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Brian Olmsted Date Completed: 06-15-04

Peer Reviewer: Stacey Coker Date Completed: 06-20-04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
MMW-50A-T01N-GRW	SA	570823		W	X	X
MMW-50A-D01N-GRW	SA	570824		W	X	
DOUGLASWELL-T01N-GRW	SA	570825		W	X	X
DOUGLASWELL-D01N-GRW	SA	570826		W	X	
SPRING13-P1-T01N-GRW	SA	570827		W	X	X
SPRING13-P1-D01N-GRW	SA	570828		W	X	
SPRING13-T01N-GRW	SA	571003		W	X	X
SPRING13-D01N-GRW	SA	571004		W	X	
SPRING13-T01D-GRW	FD	571005		W	X	X
SPRING13-D01D-GRW	FD	571006		W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues mentioned in the laboratory case narrative are addressed in the review table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, samples DOUGLASWELL-T01N-GRW and SPRING13-P1-T01N-GRW for cyanide analysis were received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect results for these samples were qualified as estimated (UJ), with an indeterminate bias direction.
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken nine days after sampling for samples collected on 5/9/04 and eight days after sampling for samples collected on 5/10/04. The pH measurements were taken 5.5 hours beyond log-in for samples collected on 5/9/04 and 5.25 hours beyond log-in for samples collected on 5/10/04. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Sodium was detected in a metal continuing calibration blank. Table 1.2 summarizes the blank detection and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	No matrix quality control results for May 2004 GRW were evaluated.
Method QC • Surrogates • Serial Dilution (C) MMW-50A-T01N-GRWL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analysis on MMW-50A-T01N-GRW was applicable for 1 of the 24 metal analytes. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. The applicable serial dilution result was within QC acceptance criteria. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/ anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within the acceptance range of 0.5 and 1.5.
Field QC • Field Duplicate SPRING13-T01D-GRW SPRING13-D01D-GRW • Rinsate Blank • Field Blank • Trip Blank	No	Table 1.3 lists the field duplicate results outside acceptance criteria.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.
Laboratory Performance Parameters	Complete with "Yes", "No", or "N/A".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	N/A	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	Yes	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Orthophosphate (mg/L)	Cond. (µmhos/cm)	pH (Std units)
MMW-50A-T01N-GRW	0.45 J	0.0050 UJ	---	1300 J	4.2 J
DOUGLASWELL-T01N-GRW	0.55 J	---	---	531 J	5.4 J
SPRING13-P1-T01N-GRW	0.36 J	---	---	1440 J	4.4 J
SPRING13-T01N-GRW	---	---	---	1970 J	3.8 J
SPRING13-T01D-GRW	---	---	---	1990 J	3.8 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Sodium DF=100	U	418.3	U	U	327.5	MMW-50A-T01N-GRW MMW-50A-D01N-GRW SPRING13-P1-T01N-GRW SPRING13-P1-D01N-GRW SPRING13-D01N-GRW SPRING13-D01D-GRW	U CCB-I

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit U = Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Field Duplicate Qualifications

Sample	Analyte	Sample Result (mg/L)	Duplicate Result (mg/L)	RL (mg/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
SPRING13-T01N/T01D-GRW	Total Suspended Solids	19.1	36.5	0.50	Diff. > 30%	63%	J FD-I

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT299C

Sampling Event: Hunts Pond and Historic Tailings Spill Investigation

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Brian Olmsted

Date Completed: 06-21-04

Peer Reviewer: Stacey Coker

Date Completed: 06-29-04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
HUNT-T01N-GRW	SA	571492		W	X	X
HUNT-D01N-GRW	SA	571493		W	X	
LS3-T01N-GRW	SA	571494		W	X	X
LS3-D01N-GRW	SA	571495		W	X	
LS2-T01N-GRW	SA	571496		W	X	X
LS2-D01N-GRW	SA	571497		W	X	
PR-5-T01N-GRW	SA	571498		W	X	X
PR-5-D01N-GRW	SA	571499		W	X	
PR-3-T01N-GRW	SA	571500		W	X	X
PR-3-D01N-GRW	SA	571501		W	X	
US-1-T01N-GRW	SA	571502		W	X	X
US-1-D01N-GRW	SA	571503		W	X	
LS1-T01N-GRW	SA	571504		W	X	X
LS1-D01N-GRW	SA	571505		W	X	
P-2-T01N-GRW	SA	571506		W	X	X
P-2-D01N-GRW	SA	571507		W	X	
PR-4-T01N-GRW	SA	571508		W	X	X
PR-4-D01N-GRW	SA	571509		W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Due to limitations on the laboratory CLP software, the field IDs were abbreviated to 12 digits. In this table, the modified Ids, if any, are listed under the CLP form Field ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues mentioned in the laboratory case narrative are addressed in the review table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The sample preservation document noted that upon log-in, samples HUNT-T01N-GRW, LS3-T01N-GRW, LS2-T01N-GRW, PR-5-T01N-GRW, PR-3-T01N-GRW, US-1-T01N-GRW, LS1-T01N-GRW and PR-4-T01N-GRW for cyanide analysis were received at a reduced pH. To attain the proper pH for preservation, the laboratory added additional NaOH. The nondetect results for these samples were qualified as estimated (UJ), with an indeterminate bias direction.
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken 6 days after the samples were logged-in. The pH measurements were taken 5.3 hours beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal continuing calibration blanks. Table 1.2 summarizes the blank detection and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	N/A	No matrix quality control results were evaluated in this package. The matrix quality control results for the Hunts Pond and Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) HUNT-T01N-GRWL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analysis on HUNT-T01N-GRWL was applicable for 1 of the 24 metal analytes. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. The applicable serial dilution result was within QC acceptance criteria. Table 1.3 lists the total versus partial results outside acceptance criteria. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within the acceptance range of 0.5 and 1.5 except LS2-T01N-GRW which exhibited a TDS ratio of 3.76. The reported TDS measurement of 82.0 mg/L was qualified as estimated with a low bias.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	This package did not include any site-specific field quality control samples. The field quality control results for the Hunts Pond and Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary.
Laboratory Performance Parameters	Complete with "Yes", "No", or "N/A".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	Yes	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Nitrite-N (mg/L)	Orthophosphate (mg/L)	Cond. (µmhos/cm)	pH (std units)
HUNT-T01N-GRW	0.27 J	0.0050 UJ	0.011 J	482 J	6.9 J
LS3-T01N-GRW	0.34 J	0.0050 UJ	0.010 UJ	333 J	6.9 J
LS2-T01N-GRW	0.44 J	---	0.010 UJ	355 J	6.9 J
PR-5-T01N-GRW	0.48 J	0.0050 UJ	0.010 UJ	378 J	7.1 J
PR-3-T01N-GRW	0.37 J	0.0050 UJ	0.010 UJ	377 J	6.9 J
US-1-T01N-GRW	0.38 J	---	---	243 J	7.2 J
LS1-T01N-GRW	0.31 J	0.0050 UJ	0.014 J	380 J	6.9 J
P-2-T01N-GRW	1.6 J	---	---	1100 J	4.9 J
PR-4-T01N-GRW	0.42 J	0.0050 UJ	0.010 UJ	258 J	7.2 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
Beryllium (P) DF=1	0.7	U	0.9	1.2	0.777	0.3	HUNT-T01N-GRW HUNT-D01N-GRW LS3-T01N-GRW LS3-D01N-GRW LS2-T01N-GRW LS2-D01N-GRW PR-5-T01N-GRW PR-3-T01N-GRW US-1-D01N-GRW LS1-T01N-GRW LS1-D01N-GRW PR-4-T01N-GRW PR-4-D01N-GRW	U CCB,MB-I
Boron (P) DF=1	-5.1	U	U	U	U	3.6	HUNT-T01N-GRW HUNT-D01N-GRW LS3-T01N-GRW LS3-D01N-GRW LS2-T01N-GRW LS2-D01N-GRW	J CCB-L or UJ CCB-L
Cadmium (P) DF=1	U	U	U	-0.4	U	0.3	PR-4-T01N-GRW PR-4-D01N-GRW	UJ CCB-L
Chromium (P) DF=1	U	U	-0.7	-1.6	U	0.6	PR-5-T01N-GRW PR-5-D01N-GRW PR-3-T01N-GRW PR-3-D01N-GRW US-1-T01N-GRW US-1-D01N-GRW LS1-T01N-GRW LS1-D01N-GRW P-2-T01N-GRW P-2-D01N-GRW PR-4-T01N-GRW PR-4-D01N-GRW	UJ CCB-L
Molybdenum (P) DF=1	U	U	-1.9	U	U	1.0	US-1-T01N-GRW US-1-D01N-GRW P-2-T01N-GRW P-2-D01N-GRW PR-4-T01N-GRW PR-4-D01N-GRW	J CCB-L or UJ CCB-L
Nickel (P) DF=1	U	U	U	-1.5	-2.346	1.5	HUNT-T01N-GRW HUNT-D01N-GRW LS3-T01N-GRW LS3-D01N-GRW LS2-T01N-GRW LS2-D01N-GRW PR-5-T01N-GRW PR-5-D01N-GRW PR-3-T01N-GRW PR-3-D01N-GRW US-1-T01N-GRW US-1-D01N-GRW LS1-T01N-GRW	UJ MB-L or J MB-L or UJ CCB.MB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Code
							LS1-D01N-GRW PR-4-T01N-GRW PR-4-D01N-GRW	

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit U = Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Total Versus Partial Qualifications

Sample	Analyte	Total Result (ug/L)	Dissolved Result (ug/L)	Dilution Adjusted RL (ug/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
LS3-T01N/D01N-GRW	Copper	1.4 U	5.4	1.4	Diff. > 2xRL	2.9xRL	J/UJ TvP-I
PR-5-T01N/D01N-GRW	Zinc	28.5	386	24.0	Diff. > 2xRL	14.9xRL	J TvP-I

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: SOL103 Sampling Event: Historic Tailings Spills

Matrix: Solid ☒ Water ☐ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 07/07/04

Peer Reviewer: Stacey Coker Date Completed: 07/07/04

The table below summarizes the results presented in this data package.

Field ID(1)	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics
ATD42-2-T01N-SOL	SA	570570	S	X	X
STD42-2-T01N-SOL	SA	570571	S	X	X
STD42-2-T01D-SOL	FD	570572	S	X	X
ATD42-1-T01N-SOL	SA	570573	S	X	X
STD42-1-T01N-SOL	SA	570574	S	X	X
ATD42-4-T01N-SOL	SA	570575	S	X	X
STD42-4-T01N-SOL	SA	570576	S	X	X
STD42-3-T01N-SOL	SA	570577	S	X	X
ATD42-3-T01N-SOL	SA	570578	S	X	X
STD42-5-T01N-SOL	SA	570579	S	X	X
ATD42-5-T01N-SOL	SA	570580	S	X	X
STD42-6-T01N-SOL	SA	570581	S	X	X
ATD42-6-T01N-SOL	SA	570582	S	X	X
STD42-8-T01N-SOL	SA	570583	S	X	X
ATD42-8-T01N-SOL	SA	570584	S	X	X
STD42-7-T01N-SOL	SA	570585	S	X	X
ATD42-7-T01N-SOL	SA	570586	S	X	X
STD41-T01N-SOL	SA	570587	S	X	X
ATD41-T01N-SOL	SA	570588	S	X	X

Matrix: S = Solid
QC Type: SA = Sample FD = Field Sample

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary: Issues noted in the case narrative, potentially affecting data quality, are addressed in the following discussion or covered in the data review summary table below.

The laboratory case narrative noted that in order to more accurately report TOC concentrations from peaks with areas lower than that of the lowest curve point, the laboratory has implemented the use of an additional low-level calibration curve for processing the results for samples with small peak areas. All samples with peak areas from at least one replicate that are lower than the lowest calibration point are processed using this curve, as well as the associated blank analyses. In this delivery group, sample STD41-T01N-SOL was processed using this low-level curve. This did not affect the quality or usability of the TOC data results.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	As noted in the laboratory log-in sheet and verified upon review of the COC forms, sample ATD2-1-T01N-SOL was received by the lab but not listed on any of the COC forms. The laboratory appropriately logged in this sample for all methods assigned to other samples in this SDG and as specified on the sample labels.
Holding Times	No	Nitrate as N has a specified holding time in the QAPP of 48 hours for soil and sediment samples. The samples were held at 4°C from their time of collection to the time of sample preparation and analysis. According to internal COC records, all samples were removed from storage on 05/20/04 at 0910 for preparation and returned the same day. The samples were analyzed for nitrate within 48 hours of the generation of the leachate. Since nitrate is likely to be quite stable at 4°C, all sample results for nitrate were qualified as estimated (J) with an indeterminate bias for exceedance of the holding time limit. The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 19 days after sampling and 17 days beyond log-in. The pH for all samples was measured 3 days beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	TOC was detected in the method blanks associated with the analyses run on 05/25/04 and 05/26/04 at concentrations of 276 mg/Kg and 322 mg/Kg, respectively. All sample results for TOC were sufficiently greater (>5x) than the blank detections, with the exception of sample STD41-T01N-SOL. As the reported TOC concentration for this sample (1020 mg/Kg) was less than five times the concentration reported in the blank (5x322→1610 mg/Kg), the sample result was qualified as nondetect at 1020 mg/Kg. Qualification was not necessary for any other inorganic analytes on the basis of method blank detections. Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. However, several results were qualified on the basis of blank detections, as summarized in Table 1.2.
Matrix QC • MS/D STD42-2-T01N-SOLMS • LD STD42-2-T01N-SOLD • PDS STD42-2-T01N-SOLA	No	Several analytes were recovered outside the acceptance range of 75-125% for the inorganics and metals matrix spike analysis of sample STD42-2-T01N-SOL. Table 1.3 summarizes these analytes, along with their recoveries and qualifications to the parent samples. Post digestion spikes were performed on all metal analytes. The post digestion spike recoveries for those analytes that did not meet the specified criterion for the initial matrix spike recoveries were reviewed. As the reviewed post matrix spike recoveries were within 75-125%, no qualification on the basis of post digestion spike recoveries were necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		Laboratory duplicate analysis results were reviewed to evaluate the precision of the laboratory analyses. No qualification of data was necessary, as the concentration dependent criteria were met. The matrix quality control results for the 2004 Historic Tailings Spills sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Serial Dilution • STD42-2-T01N-SOLL • Internal Standards	No	The serial dilution analysis conducted on matrix spike sample STD42-42-T01N-SOL was not applicable for 9 of the 24 metal analytes, as the remaining analytes exhibited initial concentrations in excess of 50 times the IDL. The percent deviations between the original results and its 5-fold dilutions were compared to an evaluation criterion of ±10%. Table 1.4 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The internal standard recoveries of ^{89}Y was high for the ICPMS analyses of samples ATD42-2-T01N-SOL, STD42-2-T01N-SOL, STD42-2-T01D-SOL. ATD42-1-T01N-SOL, ATD42-4-T01N-SOL, STD42-4-T01N-SOL, STD42-5-T01N-SOL, and STD42-6-T01N-SOL. Accordingly, molybdenum results for these samples, as verified by the run-logs, were reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution results for the 2004 Historic Tailings Spills sampling event will be evaluated collectively and any additional data qualifications will be summarized in the associated overall assessment.
Field QC • Field Duplicate STD42-2-T01N/D-SOL • Rinsate Blank • Field Blank	No	One field duplicate pair was assessed for field duplicate agreement. Several sample results did not meet the criteria set forth in SOP 12.1 for field duplicates, as summarized in Table 1.5. The field duplicate results for the 2004 Historic Tailings Spills sampling event will be evaluated collectively and any additional data qualifications will be summarized in the associated overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	**ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. Accordingly, several sample results were qualified on the basis of biases suggested by the ICS A analyses. Table 1.6 summarizes the analytes and samples for which qualification was necessary. **CRDL –** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum recovery of 167.9% and iron recovery of 158.8%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum CRDL concentrations of 20 mg/kg and iron CRDL concentration of 10 mg/kg. As all aluminum and iron concentration results were more than 2 and 3 orders of magnitude greater than the CRDL concentrations, respectively, sample results would not be affected by the elevated recoveries. Sample data were not qualified on the basis of CRDL standard recoveries.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/Kg)	Cond. (µmhos/cm)	pH (std units)
ATD42-2-T01N-SOL	8.6 J	116 J	7.7 J
ATD42-1-T01N-SOL	11.7 J	91.0 J	7.7 J
STD42-1-T01N-SOL	6.2 J	240 J	7.5 J
STD42-2-T01N-SOL	22.5 J	453 J	7.5 J
STD42-2-T01D-SOL	11.4 J	462 J	7.6 J
ATD42-4-T01N-SOL	10.5 J	35.8 J	7.5 J
STD42-4-T01N-SOL	9.1 J	654 J	7.5 J
STD42-3-T01N-SOL	54.0 J	533 J	7.6 J
ATD42-3-T01N-SOL	12.9 J	201 J	7.8 J
STD42-5-T01N-SOL	19.4 J	369 J	7.6 J
ATD42-5-T01N-SOL	7.4 J	55.4 J	7.0 J
STD42-6-T01N-SOL	114 J	1070 J	7.4 J
ATD42-6-T01N-SOL	7.2 J	59.9 J	7.4 J
STD42-8-T01N-SOL	25.5 J	604 J	7.2 J
ATD42-8-T01N-SOL	7.2 J	120 J	7.4 J
STD42-7-T01N-SOL	29.3 J	491 J	7.6 J
ATD42-7-T01N-SOL	3.5 J	30.7 J	7.1 J
STD41-T01N-SOL	4.0 J	96.4 J	6.7 J
ATD41-T01N-SOL	4.8 J	199 J	8.2 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (MS)	0.5	0.5	0.5	0.5	0.446	0.40	All sample results were qualified.	U MB,CCB-I
Boron (P)	---	---	---	---	0.461	1.8	ATD41-T01N-SOL ATD42-1-T01N-SOL ATD42-2-T01N-SOL STD42-2-T01D-SOL STD42-2-T01N-SOL ATD42-4-T01N-SOL ATD42-6-T01N-SOL ATD42-7-T01N-SOL STD42-1-T01N-SOL STD42-3-T01N-SOL STD42-4-T01N-SOL STD42-5-T01N-SOL STD42-7-T01N-SOL STD42-8-T01N-SOL	U MB-I
Mercury (CV)	-0.1	---	---	---	-0.027	0.10	All sample results were qualified.	UJ MB-L UJ MB,CCB-L
Thallium (MS)	0.1	0.1	0.1	0.1	0.12	0.10		U MB,CCB-I
Silver (P)	---	---	---	---	-0.141	1.0		UJ MB-L J MB-L
Sodium (P)	-179.4	---	-187	---	68.8	172.6		UJ MB,CCB-L U MB-I

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Qualification Codes
STD42-2-T01N-SOL				
Sulfate	73	NA	75-125%	J MS-L
TKN	139			J MS-H
Phosphorus as P	131			
Antimony	17.3	87.3		J MS-L
Selenium	156.3	85.7		NQ (ND)

NA = Not Applicable

NQ (ND) = No qualification necessary for a nondetect sample result with a potential high bias.

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
STD42-2-T01N-SOL		
Aluminum	10.7	J DL-L
Calcium	11.5	
Chromium	11.1	
Cobalt	14.8	
Iron	11.7	
Lead	14.4	
Magnesium	12.1	
Manganese	12.2	
Nickel	15.4	
Potassium	23.3	
Zinc	13.6	

Table 1.5
Field Duplicate Qualifications

Sample	Analyte	Sample Conc. (mg/Kg)	Duplicate Conc. (mg/Kg)	RL (mg/Kg)	Evaluation Criterion	Criteria Exceedance	Qualification Code
STD42-2-T01N/D-SOL	Sulfate	169	98.9	4.4	RPD +/- 50%	52 RPD	J FD-I
	Nitrate as N	22.5	11.4	2.2		65 RPD	

Table 1.6
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Boron	-10	1.8	ATD42-7-T01N-SOL	J ICS-L
Cadmium	1	0.3		J ICS-H
Sodium	-321	172.6		J ICS-L

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: SOL104 Sampling Event: Historic Tailings Spill Investigation

Matrix: Solid _X_ Water __ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 06-23-04

Peer Reviewer: Stacey Coker Date Completed: 06-29-04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
ATD8-6-T01N-SOL	SA	570855	S	X	X
ATD8-5-T01N-SOL	SA	570856	S	X	X
TD40C-T01N-SOL	SA	570857	S	X	X
STD40C-T01N-SOL	SA	570858	S	X	X
ATD40C-T01N-SOL	SA	570859	S	X	X
ATD8-4-T01N-SOL	SA	570860	S	X	X
STD45A-T01N-SOL	SA	570861	S	X	X
STD43-T01N-SOL	SA	570862	S	X	X
STD44-T01N-SOL	SA	570863	S	X	X
TD8-2-T01N-SOL	SA	570864	S	X	X
TD45A-T01N-SOL	SA	570865	S	X	X
TD44-T01N-SOL	SA	570866	S	X	X
TD43-T01N-SOL	SA	570867	S	X	X
TD46A-T01N-SOL	SA	570868	S	X	X
TD46B-T01N-SOL	SA	570869	S	X	X
ATD46B-T01N-SOL	SA	570870	S	X	X
STD46B-T01N-SOL	SA	570871	S	X	X
STD46A-T01N-SOL	SA	570872	S	X	X
STD8-3-T01N-SOL	SA	570873	S	X	X
STD8-2-T01N-SOL	SA	570874	S	X	X

Matrix: S = Solid

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative. All other issues mentioned in the laboratory case narrative are addressed in the review table below.

In order to more accurately report TOC concentrations from peaks with areas lower than that of the lowest curve point, the laboratory implemented the use of an additional low-level calibration curve for processing of results for samples with small peak areas. Samples ATD8-6-T01N-SOL, STD45A-T01N-SOL, STD43-T01N-SOL, TD43-T01N-SOL, TD46A-T01N-SOL, TD46B-T01N-SOL, STD46B-T01N-SOL and STD46A-T01N-SOL, along with the associated blank analyses, had peak areas from at least one replicate that were lower than the lowest calibration point and were therefore processed using this curve. The quality and usability of the data is not considered to be affected and data qualification was not necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken 13 days after the samples were logged in. The pH measurements were taken 1 day after samples were logged in. Therefore, all conductivity and pH results were qualified as estimated (J). Measurement of nitrate requires analysis of the samples within 48 hours of collection. All nitrate analyses were performed between 30 and 31 days after sample collection and as a result, all nitrate analyses were qualified as estimated (J). Measurement of chloride and sulfate requires analysis of the samples within 28 days of collection. All chloride and sulfate analyses were performed between 30 and 31 days after sample collection due to an instrument malfunction. As a result, all chloride and sulfate results were qualified as estimated (J).
Method Blanks	No	Various analytes were detected in the continuing calibration and method blanks. Table 1.1a and 1.1b summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD T01N-SOL (tot-P only) 01N-SOL (tot-P only) • PDS • LD	No	Matrix spike analyses were done only for total phosphorous on samples ATD8-5-T01N-SOL and STD44-T01N-SOL. Recoveries of 7% and 66% were obtained, respectively. Both sample results were qualified as estimated (J) with a low bias. The matrix quality control results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) T01N-SOLL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analysis on sample ATD8-6-T01N-SOLL was applicable for 14 of the 24 metal analytes. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. The applicable serial dilution results were all within QC acceptance criteria except for potassium which had a percent difference of 11.9%. The parent sample potassium result was qualified as estimate (J) with a low bias direction (serial dilution result was greater than initial sample result). A slightly high ^{209}Bi internal standard recovery of 123.2% associated with sample TD40C-T01N-SOL was obtained and, as a consequence, the detected thallium concentration was qualified as estimated (J) with an indeterminate bias.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	N/A	This package did not include any site-specific field quality control samples. The field quality control results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	N/A	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • Laboratory Control Sample (LCS) Results. Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1a
Inorganic Blank Detections Resulting in Qualification

Analyte	5/22/04 MB (mg/Kg)	5/26/04 MB (mg/Kg)	6/01/04 MB (mg/Kg)	RL (mg/Kg)	Samples Qualified	Qualification Code
Total Organic Carbon	675	322	294	100	STD45A-T01N-SOL TD43-T01N-SOL	U MB-I

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.1b
Metals Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS) DF=10	1.2	1.2	1.2	1.2	0.117	0.4	All samples in this data package	U CCB,MB-I
Boron (P) DF=1	U	U	U	U	0.327	1.8	ATD8-6-T01N-SOL ATD8-5-T01N-SOL TD40C-T01N-SOL ATD40C-T01N-SOL STD45A-T01N-SOL STD43-T01N-SOL STD44-T01N-SOL TD45A-T01N-SOL TD44-T01N-SOL TD43-T01N-SOL TD46A-T01N-SOL TD46B-T01N-SOL ATD46B-T01N-SOL STD46B-T01N-SOL STD46A-T01N-SOL STD8-3-T01N-SOL	U MB-I
Sodium (P) DF=1	U	-207.4	U	U	70.13	172.6	All samples in this data package	U MB-I or UJ CCB,MB-I

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL = Instrument Detection Limit U = Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: SOL105 Sampling Event: Historic Tailings Spill Investigation

Matrix: Solid _X_ Water ___ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Brian Olmsted Date Completed: 07/02/04

Peer Reviewer: Geoff Webb Date Completed: 12/10/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganics
ATD8-2-T01N-SOL	SA	570961	S	X	X
TD8-3-T01N-SOL	SA	570962	S	X	X
TD8-1-T01N-SOL	SA	570963	S	X	X
TD8-5-T01N-SOL	SA	570964	S	X	X
TD8-4-T01N-SOL	SA	570965	S	X	X
ATD8-7-T01N-SOL	SA	570966	S	X	X
TD8-7-T01N-SOL	SA	570967	S	X	X
ATD16-T01N-SOL	SA	570968	S	X	X
ATD14-T01N-SOL	SA	570969	S	X	X
STD14-T01N-SOL	SA	570970	S	X	X
STD8-7-T01N-SOL	SA	570971	S	X	X
STD8-5-T01N-SOL	SA	570972	S	X	X
STD16-T01N-SOL	SA	570973	S	X	X
STD19-T01N-SOL	SA	570974	S	X	X
TD14-T01N-SOL	SA	570975	S	X	X
ATD8-1-T01N-SOL	SA	570976	S	X	X
ATD8-3-T01N-SOL	SA	570977	S	X	X
ATD8-3-T01D-SOL	FD	570978	S	X	X
ATD43-T01N-SOL	SA	570979	S	X	X

Matrix: S = Solid

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative. All other issues mentioned in the laboratory case narrative are addressed in the review table below.

In order to more accurately report TOC concentrations from peaks with areas lower than that of the lowest curve point, the laboratory implemented the use of an additional low-level calibration curve for processing of results for samples with small peak areas. Samples TD8-7-T01N-SOL, ATD14-T01N-SOL and STD14-T01N-SOL, along with the associated blank analyses, had peak areas from at least one replicate that were lower than the lowest calibration point and were therefore processed using this curve. The quality and usability of the data is not considered to be affected and data qualification was not necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken 22 days after the samples were logged in. The pH measurements were taken 2 day after samples were logged in. Therefore, all conductivity and pH results were qualified as estimated (J). Measurement of nitrate requires analysis of the samples within 48 hours of collection. All nitrate analyses were performed between 17 and 18 days after sample collection and as a result, all nitrate analyses were qualified as estimated (J). Due to instrument malfunction, the sulfate analysis for sample TD8-7-T01N-SOL was analyzed four days beyond the 28 day holding time requirement. Therefore, the result was qualified as estimated (J) with an indeterminate bias.
Method Blanks	No	Various analytes were detected in the continuing calibration and method blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD ATD8-3-T01N-SOLS • PDS ATD8-3-T01N-SOLA • LD ATD8-3-T01N-SOLD	No	Matrix spike analysis was done on sample ATD8-3-T01N-SOL. Table 1.2 summarizes the matrix spike results outside QC acceptance limits. The matrix quality control results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution ATD8-3-T01N-SOLL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analysis on sample ATD8-3-T01N-SOLL was applicable for 14 of the 24 metal analytes. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. The applicable serial dilution results were all within QC acceptance criteria except for potassium which had a percent difference of 14.7%. The parent sample potassium result was qualified as estimate (J) with a low bias direction (serial dilution result was greater than initial sample result).
Field QC • Field Duplicate ATD8-3-T01D-SOL • Rinsate Blank • Field Blank • Trip Blank	No	Table 1.3 summarizes the field duplicate results outside QC acceptance limits. The field quality control results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	N/A	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • Laboratory Control Sample (LCS) Results Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Metals Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Code
Antimony (MS) DF=10	1.2	1.2	1.2	1.2	0.1125	0.4	All samples in this data package	U CCB,MB-I
Boron (P) DF=1	U	U	U	U	0.345	1.8	ATD8-3-T01N-SOL	U MB-I
Silver (P) DF=1	U	U	U	U	-0.109	1.0	ATD8-2-T01N-SOL TD8-3-T01N-SOL TD8-1-T01N-SOL TD8-5-T01N-SOL TD8-4-T01N-SOL ATD8-7-T01N-SOL TD8-7-T01N-SOL ATD14-T01N-SOL STD14-T01N-SOL STD8-7-T01N-SOL STD8-5-T01N-SOL STD19-T01N-SOL ATD8-1-T01N-SOL TD8-3-T01N-SOL ATD8-3-T01D-SOL ATD43-T01N-SOL	J MB-L or UJ MB-L
Sodium (P) DF=1	208.0	U	---	---	83.73	172.6	ATD8-3-T01N-SOL	U CCB,MB-I
Sodium (P) DF=1	U	U	234.3	U	83.73	172.6	ATD8-2-T01N-SOL TD8-3-T01N-SOL TD8-5-T01N-SOL TD8-4-T01N-SOL ATD8-7-T01N-SOL ATD16-T01N-SOL ATD14-T01N-SOL STD14-T01N-SOL STD8-7-T01N-SOL STD8-5-T01N-SOL STD16-T01N-SOL STD19-T01N-SOL TD14-T01N-SOL ATD8-1-T01N-SOL ATD8-3-T01D-SOL ATD43-T01N-SOL	U MB-I or UJ CCB,MB-I

MS = Mass Spectrophotometer P= ICP
CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit U = Nondetect
Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike Results and Parent Qualifications

Analyte	MS%R or MS and MSD %Rs	PDS %R	Criteria	Comment	Action
ATD8-3-T01N-SOL					
Ammonia	73%	NA	75-125%	None	J MS-L for parent and duplicate sample
Phosphorous	19%	NA		None	J MS-L for parent and duplicate sample
Antimony	38.4%	91.1%		Based on continuing calibration blank and method blank both the spiked result and sample result are qualified as nondetect. Therefore the difference between the spike level and the RL is < 1xRL.	No Qualification

NA = Not appropriate

RL = Reporting limit (generally the IDL adjusted for dilution)

Table 1.3
Field Duplicate Qualifications

Sample	Analyte	Sample Result (mg/L)	Duplicate Result (mg/L)	RL (mg/L)	Evaluation Criterion	Criteria Exceedance	Qualification Code
ATD8-3-T01N/T01D-GRW	Conductivity	93.1	46.9	5.0	RPD > 50%	66%	J FD-I

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: SOL106 Sampling Event: Historic Tailing Spill 2004

Matrix: Solid _X_ Water ___ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 07/07/04

Peer Reviewer: Stacey Coker Date Completed: 07/07/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganic
PR4-1-T01N-SOL	SA	571138	S	X	X
PR4-2-T01N-SOL	SA	571139	S	X	
STD24-T01N-SOL	SA	571140	S	X	X
PR3-1-T01N-SOL	SA	571141	S	X	
PR3-2-T01N-SOL	SA	571142	S	X	X
STD36B-T01N-SOL	SA	571143	S	X	
ATD36B-T01N-SOL	SA	571144	S	X	X
TD36B-T01N-SOL	SA	571145	S	X	
PR5-1-T01N-SOL	SA	571146	S	X	X
PR5-2-T01N-SOL	SA	571147	S	X	
PR5-3-T01N-SOL	SA	571148	S	X	X
PR5-4-T01N-SOL	SA	571149	S	X	
PR5-5-T01N-SOL	SA	571150	S	X	X
PR5-6-T01N-SOL	SA	571151	S	X	
PR5-7-T01N-SOL	SA	571152	S	X	X
GD-2-T02N-SOL	SA	571153	S	X	
GD-1-T02N-SOL	SA	571154	S	X	

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

In order to more accurately report TOC concentrations from peaks with area lower than that of the lowest curve point, the laboratory has implemented the use of an additional low-level calibration curve for processing of results for samples with small peak areas. All samples with peak areas from at least one

replicate that are lower than the lowest calibration point are processed using this curve, as well as the associated blank analyses. In this SDG samples PR4-2-T01N-SOL, STD24-T01N-SOL, and TD36B-T01N-SOL were processed using this low-level curve. The quality and usability of the data were not affected and data qualification was not necessary.

During the sulfate analysis on 6/3/04, the continuing calibration verification standards (CCV1 and CCV4) exhibited percent recoveries, 89.4% and 87.3%, that were slightly below control criteria (90-110%). The analytical results from this analytical sequence were formally reported. All of the associated samples were bracketed by the affected CCV; therefore all of the sulfate results are qualified as estimated (UJ/J CCV-L).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The original sulfate analyses for samples PR3-2-T01N-SOL, STD36B-T01N-SOL, and TD36B-T01N-SOL were accomplished within the analytical holding time. However, these samples required additional analysis at a dilution, which was accomplished 2-4 days beyond the holding time. For all of the samples in this SDG, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N. The analysis for pH and conductivity were exceeded by 2 and 9 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Arsenic, boron, silver and sodium were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS • LD	No	The laboratory analyzed a quality control matrix spike for TKN on sample PR4-1-T01N-SOL. These results have been reported in the extended data package. The recovery for the matrix spike analysis was 52%, which is outside of the acceptance limit of 90-110%. The recovery of the laboratory control sample was with-in acceptance limits. Sample PR4-1-T01N-SOL was qualified as estimated UJ/J MS-L for the matrix spike. The matrix quality control results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution PR4-1-T01N-SOL • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on the sample for PR4-1-T01N-SOL. Serial dilution results were applicable for 10 out of 24 metals each. For both samples, the percent difference between the original result and result for the diluted sample for lead, molybdenum, potassium, and zinc did not satisfy the ≤10% criterion and the results for this sample were qualified as estimated. Table 1.3 summarizes these results. The serial dilution results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. Recovery for internal standard Y was high for the ICPMS analysis of sample PR5-1-T01N-SOL, PR5-2-T01N-SOL, and PR5-5-T01N-SOL. Therefore, beryllium and molybdenum results for all samples were reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	No	This package did not include any site-specific field quality control samples. The field quality control results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results Several sample results were qualified on the basis of biases suggested by the ICS A analyses. Table 1.4 summarizes the analytes and samples for which qualification was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Sulfate (mg/L)	Conductivity (umhos/cm)	pH
PR4-1-T01N-SOL	2.5 J	---	66.2 J	8.0 J
PR4-2-T01N-SOL	3.3 J	---	146 J	9.0 J
STD24-T01N-SOL	2.3 J	---	117 J	7.8 J
PR3-1-T01N-SOL	19.4 J	---	324 J	7.3 J
PR3-2-T01N-SOL	11.5 J	232 J	704 J	7.9 J
STD36B-T01N-SOL	8.7 J	109 J	925 J	8.2 J
ATD36B-T02N-SOL	3.1 J	---	159 J	8.8 J
TD36B-T01N-SOL	2.3 J	185 J	1640 J	8.0 J
PR5-1-T01N-SOL	4.2 J	---	167 J	7.6 J
PR5-2-T01N-SOL	3.4 J	---	92 J	8.0 J
PR5-3-T01N-SOL	2.9 J	---	109 J	7.7 J
PR5-4-T01N-SOL	5.2 J	---	147 J	7.6 J
PR5-5-T01N-SOL	3.8 J	---	94.1 J	7.3 J
PR5-6-T01N-SOL	5.7 J	---	137 J	8.1 J
PR5-7-T01N-SOL	3.7 J	---	79.3 J	7.1 J
GD-2-T02N-SOL	3.3 UJ	---	112 J	6.7 J
GD-1-T02N-SOL	7.2 J	---	105 J	7.4 J

---=Samples were within hold time; therefore no qualification was necessary.

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (mg/kg)	CCB2 (mg/kg)	CCB3 (mg/kg)	CCB4 (mg/kg)	MB (mg/kg)	IDL (mg/kg)	Samples Qualified	Qualification Code
Arsenic (P) DF=1	0.39	0.32	0.44			0.26	TD36B-T01N-SOL	U CCB-I
Boron (P) DF=1	0.32	0.23	0.28	0.26	0.341	0.18	PR4-1-T01N-SOL, PR4-2-T01N-SOL, ATD36B-T02N-SOL, PR5-4-T01N-SOL	U CCB, MB-I
Silver (P) DF=1	0.16					0.10	PR4-1-T01N-SOL, STD24-T01N-SOL, PR3-2-T01N-SOL	U CCB-I
Sodium (P) DF=1					75.98	17.26	All the samples in this SDG.	U MB-I

P=ICP MB = Method Blank CCBx=Continuing Calibration Blank IDL = Instrument Detection Limit

RL=DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilution Recovery Not Meeting Criteria

Sample/ Analytes	Percent Difference	Criteria Limits	Action
PR4-1-T01N-SOL			
Lead	10.4%	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Percent difference rounds to 10%, therefore no qualification necessary.
Molybdenum	18.6%		Qualify parent sample J DL-L
Potassium	22.0%		Qualify parent sample J DL-L
Zinc	12.8%		Qualify parent sample J DL-L

Table 1.4
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Antimony	2.0	0.4	PR3-1-T01N-SOL, PR3-2-T01N-SOL, PR5-2-T01N-SOL	J/UJ ICS-H
Boron	-30	1.8		J/UJ/UJ ICS-L
Sodium	-1524	172.6		J ICS-L

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: SOL107 Sampling Event: Historic Tailing Spill 2004

Matrix: Solid _X_ _Water ___ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Ansley Watson Date Completed: 7/7/04

Peer Reviewer: Stacey Coker Date Completed: 7/9/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	Matrix	Analyses	
				Metals	Inorganic
TD8-8-T01N-SOL	SA	571247	S	X	X
STD8-1-T01N-SOL	SA	571248	S	X	X
ATD8-8-T01N-SOL	SA	571249	S	X	X
ATD19-1-T01N-SOL	SA	571250	S	X	X
TD19-T01N-SOL	SA	571251	S	X	X
TD16-T01N-SOL	SA	571252	S	X	X
STD8-4-T01N-SOL	SA	571253	S	X	X
STD8-8-T01N-SOL	SA	571254	S	X	X
ATD44-T01N-SOL	SA	571255	S	X	X
ATD45A-T01N-SOL	SA	571256	S	X	X
STD8-6-T01N-SOL	SA	571257	S	X	X
STD8-6-T01D-SOL	FD	571258	S	X	X
TD8-6-T01N-SOL	SA	571259	S	X	X
TD8-6-T01D-SOL	FD	571260	S	X	X
TB50A-T01N-SOL	SA	571261	S	X	X
ATD50A-T01N-SOL	SA	571262	S	X	X
STD1-T01N-SOL	SA	571263	S	X	X
TD1-T01N-SOL	SA	571264	S	X	X
TD1-T01D-SOL	FD	571265	S	X	X
ATD1-T01N-SOL	SA	571266	S	X	X

Matrix: S = Solid W = Water B = Biota

QC Type: SA = Sample FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting data quality but not covered in the review table below, were noted in the case narrative.

In order to more accurately report TOC concentrations from peaks with area lower than that of the lowest curve point, the laboratory has implemented the use of an additional low-level calibration curve for processing of results for samples with small peak areas. All samples with peak areas from at least one replicate that are lower than the lowest calibration point are processed using this curve, as well as the associated blank analyses. In this SDG samples TD16-T01N-SOL, STD8-4-T01N-SOL, TD8-6-T01N-SOL, TD8-6-T01D-SOL, and TD50A-T01N-SOL were processed using this low-level curve. This issue did not affect the quality of the data, therefore, no qualifications of data were necessary.

The case narrative noted that during the chloride analysis on 5/7/04, the continuing calibration verification standards exhibited percent recoveries that were slightly above control criteria. However, all of the samples in this sample delivery group (SDG) were analyzed either on 5/28/04 and 6/3/04. Therefore, the samples in this package were not affected by the elevated CCV recoveries on 5/7/04. No qualification was considered necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For a few samples, the 48-hour hold time was exceeded by less than 48 hours for nitrate as N. The analysis for pH and conductivity were exceeded by 2 and 9 days, respectively. Table 1.1 summarizes the holding time qualifications. The associated bias direction for these results qualified on the basis of holding times is considered to be indeterminate.
Laboratory Blank Results	No	Antimony, arsenic, boron, mercury, sodium, TOC were detected in various blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD/PDS STD8-6-T01N-SOL TD8-6-T01N-SOL, TD1-T01N-SOL • LD STD8-6-T01N-SOL TD8-6-T01N-SOL, TD1-T01N-SOL	No	Table 1.3 summarizes the matrix spike (MS) results outside the evaluation criteria and resultant data qualification. Table 1.4 summarizes the laboratory duplicate (LD) results outside the evaluation criteria and resultant data qualification. The matrix quality control results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution STD8-6-T01N-SOL TD8-6-T01N-SOL, TD1-T01N-SOL • Internal Standards • Total vs. Partial Analyses • Cation/Anion Balance	No	The serial dilution analyses were conducted on samples STD8-6-T01N-SOL, TD8-6-T01N-SOL, and TD1-T01N-SOL. For sample STD8-6-T01N-SOL, the serial dilution results were applicable for 10 out of 24 metals. For sample TD8-6-T01N-SOL, the serial dilution results were applicable for 5 out of 24 metals. For sample TD1-T01N-SOL, the serial dilution results were applicable for 5 out of 24 metals. For all three samples, there were a few analytes that the percent difference between the original result and result for the diluted sample did not satisfy the ≤10% criterion. The results for this sample were qualified as estimated. Table 1.5 summarizes these results. The serial dilution results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. Parent sample results were qualified on the basis of serial dilution results. Recovery for internal standard Y was high for the ICPMS analysis of sample ATD45A-T01N-SOL. Therefore, beryllium and molybdenum results for all samples were reported from the trace ICP. The trace ICP beryllium and molybdenum reporting limit met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate (FD) STD8-6-T01N-SOL TD8-6-T01N-SOL, TD1-T01N-SOL • Rinsate Blank (RB) • Field Blank (FB) • Trip Blank (TB) • Other (e.g., splits)	Yes	The field quality control results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample (ICS) Results Several sample results were qualified on the basis of biases suggested by the ICS A analyses. Table 1.6 summarizes the analytes and samples for which qualification was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate as N (mg/L)	Conductivity (umhos/cm)	pH
TD8-8-T01N-SOL	2.1 J	303 J	3.4 J
STD8-1-T01N-SOL	2.3 UJ	834 J	7.2 J
ATD8-8-T01N-SOL	2.3 UJ	52.8 J	7.3 J
ATD19-1-T01N-SOL	2.1 J	46.5 J	6.2 J
TD19-T01N-SOL	2.0 UJ	155 J	7.9 J
TD16-T01N-SOL	2.0 UJ	106 J	8.1 J
STD8-4-T01N-SOL	2.1 UJ	30.5 J	8.2 J
STD8-8-T01N-SOL	2.3 UJ	277 J	4.2 J
ATD44-T01N-SOL	7.1 J	28.5 J	7.0 J
ATD45A-T01N-SOL	7.1 J	31.4 J	7.5 J
STD8-6-T01N-SOL	4.9 J	223 J	7.6 J
STD8-6-T01D-SOL	5.7 J	253 J	7.9 J
TD8-6-T01N-SOL	2.3 J	275 J	8.4 J
TD8-6-T01D-SOL	2.3 J	293 J	8.4 J
TB50A-T01N-SOL	2.1 UJ	1920 J	3.8 J
ATD50A-T01N-SOL	4.4 J	371 J	6.6 J
STD1-T01N-SOL	2.1 J	1340 J	5.1 J
TD1-T01N-SOL	3.1 J	1660 J	7.5 J
TD1-T01D-SOL	3.1 J	1420 J	8.0 J
ATD1-T01N-SOL	2.6 J	141 J	7.4 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (Metals) RL (INORG.) (µg/l)	Samples Qualified	Qualification Code
TOC						525 208	105	STD8-4-T01N-SOL, TD8-6-T01D-SOL, TD50A-T01N-SOL	U MB-I
Antimony (MS) DF=10	0.5	0.5	0.6	0.6	0.6	0.412	0.4	TD8-8-T01N-SOL, ATD44-T01N-SOL, TD1-T01D-SOL, ATD1-T01N-SOL	U CCB, MB-I
Arsenic (P) DF=1	-.044	-0.40	-0.42	-0.55		-0.595	2.6	ATD19-T01N-SOL, TD16-T01N-SOL, STD8-4-T01N-SOL, ATD44-T01N-SOL, TD8-6-T01N-SOL TD8-6-T01D-SOL	J CCB, MB-L or J MB-L
Boron (P) DF=1						0.403	1.8	ATD8-8-T01N-SOL, ATD44-T01N-SOL, STD8-6-T01N-SOL, STD8-6-T01D-SOL, TD8-6-T01D-SOL, ATD50A-T01N-SOL, TD1-T01N-SOL, TD1-T01D-SOL	U MB-I
Mercury (P) DF=1		-0.01	-0.01				0.1	All sample in this SDG except ATD1-T01N-SOL	UJ/J CCB-L
Sodium (P) DF=1						87.28	172.6	All samples in this SDG except TD16-T01N-SOL	U MB-I

P=ICP MB=Method Blank CCBx=Continuing Calibration Blank IDL = Instrument Detection Limit RL=

DF=listed are for field sample; not blank samples.

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Comment	Action
STD8-6-T01N-SOL					
Antimony	21.2	87.6	75-125%	NONE	UJ MS-L the parent sample and the duplicate sample.
Phosphorus	63	NA		NONE	J MS-L the parent sample and the duplicate sample.
Selenium	166.8	88.8		NONE	UJ MS-H the parent sample and the duplicate sample.
TD8-6-T01N-SOL					
Antimony	35.8	89.1	75-125%	NONE	UJ MS-L the parent sample and the duplicate sample.
Molybdenum	68.2	99.2		NONE	J MS-L the parent sample and the duplicate sample.
Phosphorus	73	NA		NONE	
TKN	145	NA		NONE	J MS-H the parent sample and the duplicate sample.
TD1-T01N-SOL					
Ammonia	66	NA	75-125%	NONE	J MS-L the parent sample and the duplicate sample
Antimony	39.3	84.3		NONE	
Phosphorus	18	NA		NONE	
Selenium	152.8	85.4		NONE	UJ MS-H the parent sample and the duplicate sample

Table 1.4
Laboratory Duplicates Not Meeting Criteria

Sample/Analytes	Absolute Difference	RL (µg/l)	Evaluation Criteria	Action
TD1-T01N-SOL				
Sulfate	AD=29.3	10.5	Absolute difference >2x RL (i.e., 21.0)	These results were qualified as estimated in the parent samples and the sample duplicate (J D-I).
	RPD	**CRDL (µg/l)**	**Evaluation Criteria**	**Action**
Lead	RPD =38.4%	1.7	Both samples are > than 5x RL, precision is indicated by an RPD ≤35%.	These results were qualified as estimated in the parent samples and the sample duplicate (J D-I).

AD = Absolute difference

Table 1.5
Serial Dilution Recovery Not Meeting Criteria

Sample/Analytes	Percent Difference	Criteria Limits	Action
STD8-6-T01N-SOL			
Chromium	11.9%	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample and the duplicate sample J DL-L
Lead	11.0%		
Potassium	17.4%		
Thallium	11.3%		
Zinc	20.6%		
TD8-6-T01N-SOL			
Beryllium	18.4%	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample and the duplicate sample J DL-L
Calcium	11.3%		
Chromium	13.3%		
Iron	11.2%		
Lead	14.6%		
Magnesium	10.3%		Percent difference rounds to 10%, therefore no qualification necessary.
Manganese	12.3%		Qualify parent sample and the duplicate sample J DL-L
Nickel	21.2%		
Potassium	19.7%		
Zinc	20.0%		
TD1-T01N-SOL			
Beryllium	19.9%	Control limits not met when the concentration in the original sample is a factor of 50 above the IDL and the %D>10%	Qualify parent sample and the duplicate sample J DL-L
Cadmium	14.0%		
Calcium	12.3%		
Chromium	13.7%		
Cobalt	15.4%		
Iron	12.3%		
Lead	14.5%		
Magnesium	10.8%		
Molybdenum	10.9%		
Nickel	19.0%		
Potassium	21.1%		
Zinc	18.6%		

Table 1.6
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Boron	-20	0.2	STD8-1-T01N-SOL, STD8-8-T01N-SOL, STD8-6-T01N-SOL, STD8-6-T01D-SOL, TS50A-T01N-SOL, ATD50A-T01N-SOL, STD1-T01N-SOL, TD1-T01N-SOL, TD1-T01D-SOL	UJ/J ICS-L
Cadmium	2	0.5	STD8-1-T01N-SOL, STD8-8-T01N-SOL, STD8-6-T01N-SOL, STD8-6-T01D-SOL, TS50A-T01N-SOL, STD1-T01N-SOL	UJ/J ICS-H

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: SOL108 Sampling Event: Historic Tailings Spill Investigation

Matrix: Solid _X_ Water __ Biota ____

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike Date Completed: 07-06-04

Peer Reviewer: Stacey Coker Date Completed: 07-07-04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics
ATD46A-T01N-SOL	SA	571401		S	X	X
STD7-T01N-SOL	SA	571402		S	X	X
TD7-T01N-SOL	SA	571403		S	X	X
TD27-T01N-SOL	SA	571404		S	X	X
STD27-T01N-SOL	SA	571405		S	X	X
ATD27-T01N-SOL	SA	571406		S	X	X
STD4-T01N-SOL	SA	571407		S	X	X
TD11C-T01N-SOL	SA	571408		S	X	X
TD25-T01N-SOL	SA	571409		S	X	X
STD50A-T01N-SOL	SA	571410		S	X	X
ATD11C-T01N-SOL	SA	571411		S	X	X
ATD7-T01N-SOL	SA	571412		S	X	X
SD-3-T02N-SED	SA	571413		S	X	X
SD-2-T02N-SED	SA	571414		S	X	X
TD24-T01N-SED	SA	571415		S	X	X
ATD25-T01N-SOL	SA	571416		S	X	X
STD25-T01N-SOL	SA	571417		S	X	X
ATD24-T01N-SOL	SA	571418		S	X	X
TD4-T01N-SOL	SA	571419		S	X	X
STD11C-T01N-SOL	SA	571420		S	X	X
ATD4-T01N-SOL	SA	571421		S	X	X

Matrix: S = Solid

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative. All other issues mentioned in the laboratory case narrative are addressed in the review table below.

In order to more accurately report TOC concentrations from peaks with areas lower than that of the lowest curve point, the laboratory implemented the use of an additional low-level calibration curve for processing of results for samples with small peak areas. Samples TD27-T01N-SOL, STD27-T01N-SOL, TD25-T01N-SOL, STD50A-T01N-SOL, TD24-T01N-SOL, TD4-T01N-SOL, and STD11C-T01N-SOL, along with the associated blank analyses, had peak areas from at least one replicate that were lower than the lowest calibration point and were therefore processed using this curve. This issue did not effect the quality of the data, therefore, no qualifications of data were necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken 16 days after the samples were logged in. The pH measurements were taken 4 days after samples were logged in. Therefore, all conductivity and pH results were qualified as estimated (**J**). Measurement of nitrate requires analysis of the samples within 48 hours of collection. All nitrate analyses were performed between 30 days after sample collection and as a result, all nitrate analyses were qualified as estimated (**J**). Due to instrument malfunction, the sulfate and chloride analyses for sample for all samples analyzed one to six days beyond the 28 day holding time requirement. Therefore, the result was qualified as estimated (**J**) with an indeterminate bias. Due to an oversite by the laboratory, the TOC analyses of several samples were analyzed 9-10 days beyond holding time and as a result, the results were qualified as estimated (**J**). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	Various analytes were detected in the continuing calibration and method blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • PDS • LD	NA	Matrix QC was not analyzed for this SDG. The matrix quality control results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) ATD46A-T01N-SOLL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analysis on sample ATD46A-T01N-SOLL was applicable for 13 of the 24 metal analytes. Analytes were considered applicable if the initial sample concentrations were sufficiently larger (50x) than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. Table 1.3 summarizes the outlying serial dilution results and the resultant data qualifications.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	No	Field QC was not collected for this SDG. The field quality control results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	N/A	
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. None of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution except for iron in sample STD4-T01N-SOL. Consequently, the cadmium result for sample STD4-T01N-SOL was qualified as estimated (**J ICS-H**). • Laboratory Control Sample (LCS) Results. Laboratory control sample results were reviewed for all analytes. As all LCS results were within the acceptance range of 75-125%, no qualification of data was necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Cond. (µmhos/cm)	Chloride (mg/Kg)	Sulfate (mg/Kg)	Nitrate (mg/Kg)	pH (std units)	TOC (mg/Kg)
ATD46A-T01N-SOL	34.5 J	2.7 J	2.2 UJ	5.1 J	7.2 J	---
STD7-T01N-SOL	2110 J	5.4 J	152 J	2.3 J	5.4 J	---
TD7-T01N-SOL	2600 J	14.3 J	217 J	2.0 J	3.2 J	---
TD27-T01N-SOL	85.2 J	4.0 J	29.5 J	2.1 J	8.5 J	---
STD27-T01N-SOL	81.2 J	4.5 J	40.0 J	4.1 J	7.9 J	---
ATD27-T01N-SOL	108 J	3.4 J	69.3 J	2.9 J	5.6 J	---
STD4-T01N-SOL	1420 J	13.2 J	769 J	2.1 J	4.6 J	---
TD11C-T01N-SOL	225 J	2.7 J	46.0 J	2.4 J	5.9 J	---
TD25-T01N-SOL	1080 J	3.8 J	574 J	2.6 J	7.0 J	---
STD50A-T01N-SOL	2030 J	9.0 J	783 J	2.2 J	4.9 J	---
ATD11C-T01N-SOL	66.3 J	4.8 J	34.7 J	7.2 J	6.0 J	---
ATD7-T01N-SOL	35.5 J	3.8 J	7.8 J	7.6 J	6.8 J	11300 J
SD-3-T02N-SED	254 J	5.6 J	64.6 J	3.0 J	7.4 J	35500 J
SD-2-T02N-SED	74.9 J	4.8 J	8.9 J	2.5 UJ	7.5 J	18500 J
TD24-T01N-SOL	1390 J	2.4 J	512 J	2.2 UJ	7.8 J	1350 J
ATD25-T01N-SOL	135 J	4.5 J	67.4 J	6.8 J	6.6 J	61100 J
STD25-T01N-SOL	1990 J	32.6 J	196 J	2.1 UJ	6.0 J	22400 J
ATD24-T01N-SOL	215 J	11.0 J	51.7 J	5.3 J	8.3 J	22600 J
TD4-T01N-SOL	200 J	3.8 J	91.4 J	3.6 J	7.8 J	3730 J
STD11C-T01N-SOL	154 J	4.2 J	72.2 J	4.7 J	6.4 J	9610 J
ATD4-T01N-SOL	63.4 J	4.6 J	28.8 J	2.6 J	6.9 J	25600 J

Table 1.2
Metals Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Code
TOC DF=1	---	---	---	---	208 06/03/04 276 06/14/04	100	TD27-T01N-SOL TD24-T01N-SOL	U MB-I
Boron DF=1	---	---	---	---	0.694	1.8	ATD11C-T01N-SOL ATD24-T01N-SOL ATD25-T01N-SOL ATD27-T01N-SOL ATD46A-T01N-SOL ATD4-T01N-SOL ATD7-T01N-SOL SD-2-T02N-SED STD11C-T01N-SOL STD25-T01N-SOL STD27-T01N-SOL STD4-T01N-SOL STD50A-T01N-SOL STD7-T01N-SOL TD11C-T01N-SOL TD24-T01N-SOL TD25-T01N-SOL TD27-T01N-SOL TD4-T01N-SOL	U MB-I
Silver DF=1	---	19	---	---	---	1.0	ATD11C-T01N-SOL ATD25-T01N-SOL ATD27-T01N-SOL ATD4-T01N-SOL ATD7-T01N-SOL SD-2-T02N-SED STD27-T01N-SOL STD4-T01N-SOL STD50A-T01N-SOL TD24-T01N-SOL TD25-T01N-SOL TD27-T01N-SOL	U CCB-I
Sodium DF=1	185.1	---	177.6	200.9	89.71	172.6	ATD11C-T01N-SOL ATD25-T01N-SOL ATD27-T01N-SOL ATD4-T01N-SOL ATD7-T01N-SOL SD-2-T02N-SOL SD-3-T02N-SOL STD25-T01N-SOL STD4-T01N-SOL STD50A-T01N-SOL	U MB-I
							ATD24-T01N-SOL ATD46A-T01N-SOL STD11C-T01N-SOL STD27-T01N-SOL STD7-T01N-SOL TD11C-T01N-SOL TD24-T01N-SOL	U MB,CCB-I
Antimony DF=10	-2.3	-23	-2.3	-2.3	-2.361	0.40	All samples in this SDG	UJ CCB-L
Thallium DF-10	-01	-01	-01	-0.1	-0.115	0.10	All samples in this SDG	J/UJ CCB, MB-L

MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit U = Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
STD42-2-T01N-SOL		
Aluminum	20.1	J DL-L
Barium	16.9	
Calcium	20.3	
Chromium	28.0	
Copper	17.9	
Iron	20.4	
Lead	23.8	
Magnesium	21.2	
Manganese	21.6	
Nickel	40.5	
Potassium	28.8	
Vanadium	20.0	
Zinc	34.3	

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: SOL109 Sampling Event: Historic Tailings Spills/Hunts Pond

Matrix: Solid ☒ Water ☐ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter Date Completed: 07/06/04

Peer Reviewer: Stacey Coker Date Completed: 07/07/04

The table below summarizes the results presented in this data package.

Field ID[1]	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics
GD-3-T02N-SED	SA	571422	S	X	X
UD-1-T02N-SED	SA	571423	S	X	X
HUNT1-T01N-SOL	SA	571424	S	X	X
HUNT2-T01N-SOL	SA	571425	S	X	X
HUNT2-T02N-SED	SA	571426	S	X	X
HUNT3-T02N-SED	SA	571427	S	X	X
HUNT3-T02D-SED	FD	571428	S	X	X
HUNT1-T02N-SED	SA	571429	S	X	X
HUNT1-T02D-SED	FD	571430	S	X	X
HUNT3-T01N-SOL	SA	571431	S	X	X
HUNT3-T01D-SOL	FD	571432	S	X	X
HUNT4-T01N-SOL	SA	571433	S	X	X

Matrix: S = Solid

QC Type: SA = Sample FD = Field Sample

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary: Issues noted in the case narrative, potentially affecting data quality, are addressed in the following discussion or covered in the data review summary table below.

The laboratory case narrative noted that in order to more accurately report TOC concentrations from peaks with areas lower than that of the lowest curve point, the laboratory has implemented the use of an additional low-level calibration curve for processing the results for samples with small peak areas. All samples with peak areas from at least one replicate that are lower than the lowest calibration point are processed using this curve, as well as the associated blank analyses. In this delivery group, samples HUNT3-T02N-SED, HUNT1-T02N-SED, and HUNT1-T02N-SED were processed using this low-level curve. This did not affect the quality or usability of the TOC data results.

In addition, the laboratory case narrative noted that during the ICP/MS metals analysis designated 052804-02, the analyst inadvertently analyzed 11 samples (instead of 10) between the calibration check analyses designated CCV1/CCB1 and CCV2/CCB2. Sample HUNT2-T01N-SOL was formally reported

from this sequence. None of the ICP/MS analytes were recovered in either CCB1 or CCB2, nor CCV1 or CCV2, therefore professional judgment concluded this did not affect the quality or usability of the data.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	As noted in the laboratory log-in sheet and verified upon review of the COC, requested analyses for samples GD-3-T02N-SED, UD-1-T02N-SED, HUNT1-T01N-SOL, and HUNT2-T01N-SOL were not marked on the COC. The laboratory appropriately assigned all methods as assigned to other samples in this SDG and as requested on the sample labels.
Holding Times	No	Nitrate as N has a specified holding time in the QAPP of 48 hours for soil and sediment samples. The samples were held at 4°C from their time of collection to the time of sample preparation and analysis. According to internal COC records, all samples were removed from storage on 05/24/04 at 0800 for preparation and returned the same day. The samples were analyzed for nitrate within 48 hours of the generation of the leachate. As such, all sample results for nitrate were qualified as estimated (J/UJ) with an indeterminate bias for exceedance of the holding time limit. Since the nitrate is likely to be quite stable at 4°C, it was the judgment of the reviewer that nondetect results did not require rejection for the samples being analyzed after more than 2X the holding time limit. The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 16 days after sampling and 14 days beyond log-in. The pH for all samples was measured 6 days beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time were assigned indeterminate direction of bias.
Method Blanks	No	TOC was detected in the method blank associated with analysis run of 05/24/04 at a concentration of 291 mg/Kg. All sample results for TOC were sufficiently greater (>5x) than the blank detection, with the exception of sample HUNT-1-T02N-SED. As the reported TOC concentration for this sample (689 mg/Kg) was less than five times the concentration reported in the blank, the sample result was qualified as nondetect at 689 mg/Kg. Qualification was not necessary for any other inorganic analytes on the basis of method blank detections. Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. However, several results were qualified on the basis of blank detections, as summarized in Table 1.2.
Matrix QC • MS/D HUNT1-T02N-SEDMS HUNT3-T01N-SOLMS • LD HUNT1-T02N-SEDREP HUNT3-T01N-SOLREP • PDS HUNT1-T02N-SEDA HUNT3-T01N-SOLA	No	Several analytes were recovered outside the acceptance range of 75-125% for the inorganics and metals matrix spike analysis of samples HUNT1-T02N-SED and HUNT3-T01N-SOL. Table 1.3 summarizes these analytes, along with their recoveries and qualifications to the parent samples. Post digestion spikes were performed on all metal analytes. The post digestion spike recoveries for those analytes that did not meet the specified criterion for the initial matrix spike recoveries were reviewed. As the reviewed post matrix spike recoveries were within 75-125%, no qualification on the basis of post digestion spike recoveries were necessary. Laboratory duplicate analysis results were reviewed to evaluate the precision of the laboratory analyses. Table 1.4 summarizes the sample results qualified on the basis of laboratory duplicates, as the criteria specified in SOP 12.1 was not met in these instances. In addition, despite the fact that the laboratory duplicate summary forms reported RPDs in excess of the evaluation criterion for several metal analytes, no qualification of data was necessary when the CRDL was used in place of the IDL, adjusted for dilution, for the concentration-dependent comparison calculations. The matrix quality control results for the 2004 Historic Tailings Spills and Hunts Pond sampling events will be evaluated collectively and any additional data qualification will be summarized in the overall assessments.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Serial Dilution HUNT1-T02N-SEDL HUNT3-T01N-SOLL • Internal Standards	No	The serial dilution analyses conducted on matrix spike samples HUNT1-T02N-SED and HUNT3-T01N-SOL were not applicable for 11 and 9 of the 24 metal analytes, respectively, as the remaining analytes exhibited initial concentrations in excess of 50 times the IDL. The percent deviations between the original results and its 5-fold dilutions were compared to an evaluation criterion of ±10%. Table 1.5 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The internal standard recoveries of ^{89}Y was high for the ICPMS analyses of samples GD-3-T02N-SED, UD-1-T02N-SED, HUNT3-T01D-SOL, and HUNT4-T01N-SOL. Accordingly, molybdenum results for these samples, as verified by the run-logs, were reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution results for the 2004 Historic Tailings Spills and Hunts Pond sampling events will be evaluated collectively and any additional data qualifications will be summarized in the associated overall assessments.
Field QC • Field Duplicate HUNT3-T02N/D-SED HUNT1-T02N/D-SED HUNT3-T01N/D-SOL • Rinsate Blank • Field Blank	Yes	Three field duplicate pairs were assessed for field duplicate agreement. A few sample results did not meet the criteria as set forth in SOP 12.1 for field duplicates, as summarized in Table 1.6. The field duplicate results for the 2004 Historic Tailings Spills and Hunts Pond sampling events will be evaluated collectively and any resultant data qualifications will be summarized in the associated overall assessments.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes", "No", or "N/A".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes", "No", or "N/A".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS • CRDL	Yes	Information regarding the mass calibration and resolution are not available due to the software limitations. However, acceptable performance can be inferred from the other QC sample results, which satisfied evaluation criteria. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. Accordingly, several sample results were qualified on the basis of biases suggested by the ICS A analyses. Table 1.7 summarizes the analytes and samples for which qualification was necessary. **CRDL –** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum recovery of 177.8% and iron recovery of 140.6%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum CRDL concentrations of 20 mg/kg and iron CRDL concentration of 10 mg/kg. As all aluminum and iron concentration results were more than 2 and 3 orders of magnitude greater than the CRDL concentrations, respectively, sample results would not be affected by the elevated recoveries. Sample data were not qualified on the basis of CRDL standard recoveries.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate (mg/Kg)	Cond. (μmhos/cm)	pH (std units)
GD-3-T02N-SED	3.2 J	179 J	7.0 J
UD-1-T02N-SED	4.0 J	165 J	7.5 J
HUNT1-T01N-SOL	5.3 J	376 J	7.2 J
HUNT2-T01N-SOL	4.2 J	166 J	8.1 J
HUNT2-T02N-SED	2.8 UJ	167 J	7.3 J
HUNT3-T02N-SED	3.4 J	133 J	7.3 J
HUNT3-T02D-SED	3.2 J	146 J	7.2 J
HUNT1-T02N-SED	2.8 UJ	123 J	7.3 J
HUNT1-T02D-SED	2.8 UJ	123 J	7.3 J
HUNT3-T01N-SOL	2.3 UJ	1360 J	7.6 J
HUNT3-T01D-SOL	4.0 J	1430 J	7.6 J
HUNT4-T01N-SOL	4.9 J	222 J	7.3 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (MS)	-0.6	-0.6	-0.6	-0.6	-0.648	0.40	All sample results were qualified with the **exception** of: HUNT2-T01N-SOL HUNT3-T01N-SOL	UJ MB,CCB-L
Boron (P)	---	---	---	---	0.771	1.8	All sample results were qualified with the **exception** of: HUNT-3-T02D-SED HUNT4-T01N-SOL	U MB-I
Mercury (CV)	---	-0.1	---	---	---	0.10	All sample results were qualified with the **exception** of: HUNT3-T01D-SOL HUNT-4-T01N-SOL	UJ CCB-L
Silver (P)	---	---	---	-1.0	-0.197	1.0	All sample results were qualified.	J MB-L UJ MB-L UJ MB,CCB-L J MB,CCB-L
Sodium (P)	---	---	---	---	49.68	172.6	All sample results were qualified.	U MB-I

MS=ICP-MS P=ICP CV = Cold Vapor CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Qualification Codes
HUNT1-T02N-SED				
Phosphorus as P	28	NA	75-125%	J MS-L
Antimony	39.6	88.8		UJ MS-L
HUNT3-T01N-SOL				
Sulfate	61	NA	75-125%	J MS-L
Nitrate as N	132	NA		NQ (ND)
Antimony	19.1	88.4		R MS-L
Selenium	133.6	84.9		NQ (ND)

NA = Not Applicable

NQ (ND) = No qualification necessary for a nondetect sample result with a potential high bias.

Table 1.4
Laboratory Duplicate Results and Parent Sample Qualifications

Analyte	Sample Result	Duplicate Result	Criteria Comment	Outside Criteria	RL	Qualification to Parent Sample Result
HUNT1-T02N-SED						
Chloride (mg/Kg)	6.6	4.1	RPD +/-35%	47 RPD	0.20	J D-I
Lead (mg/Kg)	18.38	35.78		64.2 RPD	3	

RPD = Relative Percent Difference

Table 1.5
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
HUNT1-T02N-SED		
Lead	14.5	J DL-L
Potassium	14.2	
HUNT3-T01N-SOL		
Lead	18.1	J DL-L

Table 1.6
Field Duplicate Qualifications

Sample	Analyte	Sample Conc. (mg/Kg)	Duplicate Conc. (mg/Kg)	RL (mg/Kg)	Evaluation Criterion	Criteria Exceedance	Qualification Code
HUNT3-T02N/D-SED	Phosphorus as P	368	101	27.2	RPD +/- 50%	113 RPD	J FD-I
	TOC	3470	18500	141		137 RPD	
HUNT1-T02N/D-SED	Sulfate	75.4	28.8	2.7		89 RPD	J FD-I
	TKN	355	123	32.5		114 RPD	
	TOC	689	5640	136		156 RPD	UJ/J FD-I
HUNT3-T01N/D-SOL	Sulfate	783	1450	22.1		60 RPD	J FD-I
	Phosphorus as P	169	494	20.5		98 RPD	

Table 1.7
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Boron	-4	1.8	GD-3-T02N-SED UD-1-T02N-SED	J ICS-L

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: SPLP02 Sampling Event: Historic Tailings Spill Investigation

Matrix: Soil _X_ Sediment____Water ___ Biota ___

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Brian Olmsted Date Completed: 07/06/04

Peer Reviewer: Stacey Coker Date Completed: 07/07/04

Field ID	QC Type	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals[1]	Inorganics[1, 2]
TD7-T01N-SOL	SA	574797	Leachate Fluid #2	L	X	X
TD7-T01N-SOL	SA	574798	Leachate Fluid #3	L	X	X
TD24-T01N-SOL	SA	574800	Leachate Fluid #2	L	X	X
TD24-T01N-SOL	SA	574801	Leachate Fluid #3	L	X	X
TD8-T01N-SOL	SA	574803	Leachate Fluid #2	L	X	X
TD8-T01N-SOL	SA	574804	Leachate Fluid #3	L	X	X

Matrix: S = Soil Sed = Sediment W = Water B = Biota L= Leachate

QC Type: SA = Sample TB = Trip Blank RB = Rinsate Blank FB = Field Blank FD = Field Duplicate

[1]Analyzed for on SPLP leachate matrix.

[2]In order to analyze for all inorganic parameters without interferences, two leachate fluids were generated.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary:

The analytical results presented in the enclosed submittal represent SPLP analyses performed at the request of the client for samples received in May 2004. These samples were originally reported in SDG SOL105, SOL107, and SOL108.

Sample TD8-T01N-SOL was prepared by compositing equal weights from each individual TD8 sample (TD8-1 through TD8-8).

All additional issues noted in the case narrative that potentially affect data quality are addressed in the data review table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	All samples were analyzed within appropriate holding times from the time the SPLP Leachate samples were generated.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications. Although bicarbonate was detected in the method blank, it was not necessary to qualify associated sample results. For sample TD24-T01N-SOL, the bicarbonate result reported was < 5c the amount present in the method blank. However, the predicted bicarbonate alkalinity result at a pH of 9.5 is consistent with the observed amount of 20.7 mg/l. The pH of the final leachate sample was 9.33. Because the measured bicarbonate was consistent with the pH of the leachate sample, the bicarbonate result was not considered to be affected by blank contamination.
Matrix QC • MS/MSD/PDS • LD	NA	No matrix QC sample were included in this data package. The matrix quality control results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution TD7-T01N-SOLL TD8-T01N-SOLL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analysis performed on TD7-T01N-SOLL was applicable for 2 of the 11 metal analytes. The serial dilution analysis performed on TD8-T01N-SOLL was applicable for 1 of the 13 metal analytes. The percent differences (%Ds) between the initial sample results and the serial dilution results (5x) were compared to an evaluation criteria of ±10%, all applicable analytes were within acceptance criteria.
Field QC • Field Duplicate • Rinsate Blank • Field Blank • Trip Blank	NA	This package did not include any site-specific field quality control samples. The field quality control results for the Historic Tailing Spill Investigation 2004 sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	NA	
Package Completeness	Yes	
Other parameters evaluated on the basis of case narrative comments or review of laboratory performance parameters.	NA	
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	NA	

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation.

Table 1.1
Blank Detections and Qualifications

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	RL/IDL (µg/l)	Samples Qualified	Qualification Codes
Ammonia, SPLP Leachate	U	-	-	64	40	All samples in this data package	U MB-I
Phosphorous, SPLP Leachate	U	-	-	10	10	TD24-T01N-SOL	U MB-I
Chloride	U	U	-	270	200	TD7-T01N-SOL TD24-T01N-SOL	U MB-I
Boron (P) DF=1	U	U	-	11.48	1.8	All samples in this data package	U MB-I
Chromium (P) DF=1	-0.8	-1.0	-	-2.176	0.8	All samples in this data package	UJ CCB,MB-L
Copper (MS) DF=1	-1.2	-1.2	-1.2	U	0.8	TD24-T01N-SOL	J CCB-L
Nickel (MS) DF=1	-1.2	-1.1	-1.1	-1.111	0.9	TD24-T01N-SOL TD8-T01N-SOL	UJ CCB,MB-L
Thallium (MS) DF=1	U	0.1	U	U	0.1	TD7-T01N-SOL TD24-T01N-SOL	U CCB-I
Sodium (P) DF=1	U	U	-	998.5	172.6	All samples in this data package	U MB-I
Zinc (P) DF=1	U	U	-	13.11	1.5	TD24-T01N-SOL TD8-T01N-SOL	U MB-I

P=ICP MS=ICP-MS MB=Method Blank CCBx-Continuing Calibration Blank IDL=Instrument Detection Limit RL= Reporting Limit
U=Non-detect

For the sake of brevity the table is limited to those blank results that indicated qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA VALIDATION REPORT
FOR THE
MAY 2004 SUPPLEMENTAL SOUTH TAILINGS INVESTIGATION

Prepared for

Molycorp, Inc.
Questa, New Mexico

December 2004

URS

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Narratives 3-1

3.1 Data Review Narratives 3-1
3.1.1 General Data Quality Issues 3-1
3.1.2 Dilution Schemes/Non-Detects With Elevated Rls 3-1
3.1.3 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 3-1
3.1.4 Non-Valid Matrix Spikes 3-2
3.1.5 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Assessment and Summary of Matrix QC Results 4-1

4.1 Matrix Spike Evaluation 4-1
4.1.1 Matrix Spike Results for Groundwater Samples 4-2
4.1.2 Matrix Spike Results for Surface Water Samples 4-2
4.1.3 Matrix Spike Results for Biota Samples 4-3
4.1.4 Matrix Spike Results for Soil Samples 4-3
4.2 Laboratory Duplicate Analyses 4-4
4.2.1 Laboratory Duplicate Results for Groundwater Samples 4-5
4.2.2 Laboratory Duplicate Results for Surface Water Samples 4-5
4.2.3 Laboratory Duplicate Results for Biota Samples 4-5
4.2.4 Laboratory Duplicate Results for Soil Samples 4-6
4.3 Serial Dilution Evaluation 4-6
4.3.1 Serial Dilution Results for Groundwater Samples 4-6
4.3.2 Serial Dilution Results for Surface Water Samples 4-7
4.3.3 Serial Dilution Results for Biota Samples 4-7
4.3.4 Serial Dilution Results for Soil Samples 4-8

Section 5 Collective Summary/Assessment of Field QC Results 5-1

5.1 Field Duplicate Evaluation 5-1
5.1.1 Field Duplicate Results for Groundwater Samples 5-1
5.1.2 Field Duplicate Results for Surface Water Samples 5-1
5.1.3 Field Duplicate Results for Biota Samples 5-2
5.1.4 Field Duplicate Results for Soil Samples 5-2
5.1.5 Groundwater Rinsate Blank Results 5-3
5.1.6 Surface Water Rinsate Blank Results 5-3
5.1.7 Biota Rinsate Blank Results 5-3
5.1.8 Soil Rinsate Blank Results 5-4

TABLE OF CONTENTS

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-1
6.4 Representativeness 6-2
6.5 Comparability 6-2
6.6 Sensitivity 6-2

List of Attachments

Attachment 1.1 Data Review Summary for Data Package WAT294C

Attachment 1.2 Data Review Summary for Data Package WAT295C

Attachment 1.3 Data Review Summary for Data Package WAT296C

Attachment 1.4 Data Review Summary for Data Package WAT297S

Attachment 1.5 Data Review Summary for Data Package BIO058

Attachment 1.6 Data Review Summary for Data Package BIO059

Attachment 1.7 Data Review Summary for Data Package BIO060

Attachment 1.8 Data Review Summary for Data Package SOL102

Attachment 1.9 Data Review Summary for Data Package SOL101

Attachment 1.10 Data Review Summary for Data Package L44850

This report contains the results of the data validation conducted for 15 groundwater, 6 surface water, 52 biota and 11 soil samples and associated quality control (QC) samples collected in May 2004 Supplemental South of Tailings Investigation for the Molycorp RI/FS. Additionally, soil samples collected in association with the February 2004 installation of MMW-50A were included in this collective assessment.

The May 2004 samples were sent to STL Burlington, in Colchester, Vermont for metals and inorganic analyses. The May 2004 results were reported in eight STL-B data packages (WAT294C, WAT295C, WAT296C, WAT297S, BIO058, BIO059, BIO060, and SOL102). The field sample IDs and associated data package numbers for the May 2004 samples are provided in Table 1-1.

Table 1-1

Data Package	Field ID Recorded on COC[1]	QC Designation
WAT294C	RB01T-SOL	RB
	RB01T-WASH	RB
	RB02T-WASH	RB
	RB01T-PLT	RB
	RB02T-PLT	RB
	RB03T-PLT	RB
	RB04T-PLT	RB
	DP-13-T01N-GRW	
	DP-7-T01N-GRW	
	DP-4-T01N-GRW	
WAT295C	DP-14-T01N-GRW	MS, SD, LD
	DP-14-T01D-GRW	FD
	DP-10-T01N-GRW	
	RB01T-GRW	RB
	DP-12-T01N-GRW	
	DP-11-T01N-GRW	
	DP-6-T01N-GRW	
	DP-9-T01N-GRW	
	DP-5-T01N-GRW	
	DP-8-T01N-GRW	
WAT296C	SPRING8-T01N-GRW	
	SPRING7-T01N-GRW	
	RB01T-SOL	RB, Cyanide analysis only
	US-2-T01N-GRW	MS, LD, SD
	US-2-T01D-GRW	FD
	US-3-T01N-GRW	

Table 1-1

Data Package	Field ID Recorded on COC[1]	QC Designation
WAT297S	LR6-T01N-SFW	
	LR4-T01N-SFW	
	LR-4U-T01N-SFW	
	GARDEN1-T01N-IRW	
	RB01T-SFW	RB
BIO058	TSS17-33-T01N-GU	
	TSS17-33-T02N-GU	
	TSS17-33-T02D-GU	FD
	TSS17-33-T01N-FU	MS, LD, SD
	TSS17-33-T02N-FU	
	TSS17-33-T02D-FU	FD
	TSS17-33-T01N-GW	
	TSS17-33-T02N-GW	
	TSS17-33-T02D-GW	FD
	TSS17-33-T01N-FW	MS, LD, SD
	TSS17-33-T02N-FW	
	TSS17-31-T01N-GU	
	TSS17-31-T02N-GU	
	TSS17-31-T01N-SU	
	TSS17-31-T02N-SU	
	TSS17-31-T01N-FU	MS, LD, SD
	TSS17-31-T02N-FU	
	TSS17-31-T01N-GW	
	TSS17-31-T02N-GW	
	TSS17-31-T01N-SW	
BIO059	TSS17-31-T02N-SW	
	TSS17-31-T01N-FW	
	TSS17-31-T01D-FW	FD
	TSS17-31-T02N-FW	MS, LD, SD
	TSS17-41-T01N-GU	
	TSS17-41-T02N-GU	
	TSS17-41-T01N-GW	
	TSS17-41-T02N-GW	
	TSS17-41-T01N-FU	
	TSS17-41-T02N-FU	
	TSS17-41-T01N-FW	
	TSS17-41-T02N-FW	
	TSS17-41-T02D-FU	FD
	TSS17-39-T01N-GW	
	TSS17-39-T02N-GW	
	TSS17-39-T01N-FW	
	TSS17-39-T02N-FW	
	TSS17-39-T01D-FW	FD
	TSS17-39-T01N-GU	
	TSS17-39-T02N-GU	

Table 1-1

Data Package	Field ID Recorded on COC[1]	QC Designation
BIO060	TSS17-39-T01N-FU	SD
	TSS17-39-T02N-FU	
	TSS17-37-T01N-GU	
	TSS17-37-T02N-GU	
	TSS17-37-T01N-GW	
	TSS17-37-T02N-GW	
	TSS17-37-T02D-GW	FD
	TSS17-37-T01N-FU	
	TSS17-37-T02N-FU	
	TSS17-37-T01N-FW	
	TSS17-37-T02N-FW	
	TSS17-35-T01N-GU	
	TSS17-35-T02N-GU	
	TSS17-35-T01N-FU	
	TSS17-35-T02N-FU	
	TSS17-35-T01N-GW	
	TSS17-35-T02N-GW	
	TSS17-35-T01N-FW	
	TSS17-35-T02N-FW	
SOL102	TSS17-39-T01N-SOL	
	TSS17-40-T01N-SOL	
	TSS17-32-T01N-SOL	
	TSS17-35-T01N-SOL	
	TSS17-41-T01N-SOL	
	TSS17-33-T01N-SOL	MS, LD, SD
	TSS17-33-T01D-SOL	FD
	TSS17-34-T01N-SOL	
	TSS17-37-T01N-SOL	
	TSS17-36-T01N-SOL	
	TSS17-38-T01N-SOL	
	TSS17-31-T01N-SOL	

SOL = Soil SFW = Surface Water GRW = Groundwater BIO = Biota IRW = Irrigation Water
LD = Laboratory Duplicate MS = Matrix Spike SD = Serial Dilution RB = Rinsate Blank FD = Field Duplicate

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis of the groundwater and surface water samples.

During the February 2004 installation of mine monitoring well MMW-50A, soil samples were collected from the boring. Aliquots of the soil samples were sent to STL-B for the analysis of metals and selected inorganics and to ACZ Laboratories in Steamboat Springs, Colorado (ACZ) for analysis of total molybdenum (biased sub-sample), SPLP metals (at both 20:1 and 3:1 fluid to solid ratios), and acid-base accounting analyses. The STL-B soil sample results were reported in one data package, SOL101. The ACZ results were reported in data package L44850. The field sample IDs and associated data package numbers are provided in Table 1-2.

Table 1-2

Sample and Analysis Cross Reference

Data Package	Field ID	Metals	Inorganics	SPLP Metals	ABA	QC Designation
SOL101	MMW-50A-T01N-SOL	X	X [2]			
	MMW-50A-T02N-SOL	X	X [2]			
	MMW-50A-T03N-SOL	X	X [2]			
L44850	MMW-50A-T01N-SOL	X [3]			X	
	MMW-50A-T01N-SOL 3:1			X		
	MMW-50A-T01N-SOL 20:1			X		
	MMW-50A-T02N-SOL	X [3]			X	
	MMW-50A-T02N-SOL 3:1			X		
	MMW-50A-T02N-SOL 20:1			X		
	MMW-50A-T03N-SOL	X [3]			X	
	MMW-50A-T03N-SOL 3:1			X		
	MMW-50A-T03N-SOL 20:1			X		MS/MSD

SOL = Soil GRW = Groundwater SPLP = Synthetic Precipitation Leaching Procedure
ABA = Acid Base Accounting MS = Matrix Spike SD = Serial Dilution MSD = Matrix Spike Duplicate

[1] Inorganics - aqueous media per RI/FS QAPP.

[2] Inorganics limited to sulfate, fluoride, TOC and paste pH.

[3] Molybdenum only; laboratory was directed to take a biased subsample.

This data validation report describes the data validation process used and presents the data review results for the groundwater and soil and associated QC samples submitted to STL and ACZ for chemical analysis.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, matrix spike recoveries, laboratory duplicate or spike duplicate analysis, post-digestion spike recoveries, ICP serial dilution analysis agreement, and results for field quality control samples (e.g., field duplicates and rinsate blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1 and is as follows: if no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used; if no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used; if no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

In all cases of professional judgment exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative. Section 3.0 and Attachment 1 provide the data review narratives for each of the data packages.

The site-specific matrix spike/matrix spike duplicate (MS/MSD) results, laboratory duplicate results, serial dilution results, blanks (rinsate), field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (MS/MSD results, laboratory duplicate results, and serial dilution results) and associated sample qualification. Section 5.0 presents the collective summary of the field QC results (rinsate blanks and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

3.1 DATA REVIEW NARRATIVES

The results for the laboratory performance and sample-specific reviews are discussed in the individual review summaries which are included in Attachment 1. The data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files. All data validation qualifiers, reason codes and bias codes are stored in the electronic database.

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. The May, 2004 South of Tailings Investigation groundwater, surface water, biota and soil sample results were reported in eight original data packages, including Sample Delivery Groups (SDGs) WAT294C, WAT295C, WAT296C, WAT297S, BIO058, BIO059, BIO060 and SOL102. All samples were reviewed for the sample-specific criteria described in Section 2.0. Laboratory performance parameters were evaluated on data packages WAT297S, BIO058 and SOL102. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters that exceeded acceptance criteria during the laboratory performance criteria review

3.1.1 General Data Quality Issues

During the data review process, several issues were identified which globally affected all relevant water samples analyzed for the May, 2004 South of Tailings Investigation. Although these issues may have been addressed in the individual data review summary reports, it was considered necessary to summarize them this data validation report.

3.1.2 Dilution Schemes/Non-Detects with Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

3.1.3 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the analyses. The matrix-spiked samples were found to have significantly different pHs than the parent samples

due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy of the analysis.

3.1.4 Non-Valid Matrix Spikes

There were a further three scenarios (plus the bicarbonate and total alkalinity issue discussed in the previous section) in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. First, when native sample concentrations were greater than or equal to four times the spiking concentration, the ability to determine accuracy in the analysis was not accurate as the difference in the spike level with the original analyte concentration was not so discernable due to high concentration levels. In addition, there were several instances in which the reporting limits for various metal analytes were increased due to dilution factors, which affected the reliable quantitation of several spiked metals. In these situations, the reporting limit was greater than the spike concentration added. Related to this scenario, is the last instance in which the difference between the RL concentration and the spike concentration was less than the RL value.

3.1.5 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL data packages WAT297S, BIO058 and SOL102 were used to evaluate laboratory performance criteria. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review.

In conducting the collective assessment of the matrix QC results, the matrices of groundwater, surface water, biota, and soil were evaluated separately. The evaluations were separated by test method into inorganics and metals. For discussion, these test methods were segregated as a subset of each matrix.

For a matrix spike result to be considered valid for assessing accuracy, the native sample concentration had to be less than four times the spike concentration. A number of spikes for various matrices were outside of the QC acceptance range of 75%-125% and a number of spike results were inappropriate for assessing accuracy. In general, if less than one quarter of the valid spike recoveries for a given metal were outside of the acceptance range, only the parent sample results were qualified as estimated. If more than one quarter were outside of the acceptance range, the results for that metal were further scrutinized to determine if a bias existed that could be related to a particular exposure area. In some cases, it was not possible to determine a particular bias direction, because both low and high recoveries were observed and could have been due to sample heterogeneity rather than a true analytical bias. In such cases, and indeterminate bias direction was assigned. Otherwise, an appropriate bias direction was assigned.

Post-digestion spikes (PDS) were conducted for all ICP and ICP/MS analytes to aid in determining whether the sample matrix, a bias in the analytical system, or a combination of both, caused the matrix spike results that were outside of acceptance limits. Recoveries for nearly all post-digestion spikes were within acceptance limits. Of those that were outside of acceptance limits, it was found that the parent sample concentration was greater than 4 times the spike concentration and therefore not appropriate for assessing accuracy or assigning qualification. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect occurring during digestion rather than a bias in the analytical system.

Serial dilution tests involve the analysis of a sample and a five-fold dilution of the same sample. When analyte concentrations are sufficiently high (i.e., greater that 50x the instrument detection limit [IDL]), the original result and diluted sample result are expected to be fairly comparable. If the results are not comparable, it is generally assumed that there are matrix interferences that are resulting in the suppression of elevation of the signal for one or more analytes.

The original and diluted sample results are compared by a percent difference. (%D). When %Ds <10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate that the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result.

4.1 MATRIX SPIKE EVALUATION

The matrix spike evaluation is discussed below by matrix. The groundwater, surface water, biota, and soil are discussed in Sections 4.1.1, 4.1.2, 4.1.3 and 4.1.4 respectively.

4.1.1 Matrix Spike Results for Groundwater Samples

The table below illustrates the site-samples that were used to prepare groundwater matrix spike samples. As two MS was prepared and analyzed for 15 field samples (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
DP-14-T01N-GRW	Groundwater	WAT295C	Metals and Inorganic Parameters
US-2-T01N-GRW	Groundwater	WAT296C	Metals and Inorganic Parameters

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

One spike recovery was outside of the QC acceptance limits of 75%-125%. The table below summarizes the outlying result and the resultant data qualification

Analyte	Recoveries <75%	Recoveries >125%	Number of Valid Spike Results	Average MS %R	Action
Total Metals					
Iron	---	130.4	2	122.2	None, sample result was nondetect

The matrix spike recovery for iron was above evaluation criteria (130.4%). Since the parent sample result was nondetect, no qualifications of data were necessary. As only one of the two iron matrix spike recoveries were outside acceptance limits, and the recovery was only slightly above the 125% limit and the average recovery was less than 125%, it was not considered to be systematic, and no overall data qualification was considered necessary.

4.1.2 Matrix Spike Results for Surface Water Samples

The table below illustrates the site-samples that were used to prepare surface water matrix spike samples. As one MS was prepared and analyzed for six field samples (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID[1]	Matrix	Data Package	Analyses
HUNT1-T01N-SFW	Surface water	WAT297S	Metals and Inorganic Parameters

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

One spike recovery was outside of the QC acceptance limits of 75%-125%. The table below summarizes the outlying result and the resultant data qualification.

Analyte	Recoveries <75%	Recoveries >125%	Number of Valid Spike Results	Average MS %R	Action
Total Inorganics					
Ammonia	67	---	1	67	Qualify all surface water ammonia results as estimated J/UJ MS-L

4.1.3 Matrix Spike Results for Biota Samples

The table below illustrates the site-samples that were used to prepare biota matrix spike samples. As four MSs were prepared and analyzed for 52 field samples (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
TSS17-33-T01N-FU	Biota	BIO058	Metals
TSS17-33-T01N-FW	Biota	BIO058	Metals
TSS17-31-T02N-FU	Biota	BIO058	Metals
TSS17-31-T02N-FW	Biota	BIO059	Metals

Several biota matrix spike results were outside of the QC acceptance limits of 75%-125%. The table below summarizes the outlying result and the resultant data qualification.

Analyte	Recoveries <75%	Recoveries >125%	Number of Valid Spike Results	Average MS %R	Action
Total Metals					
Arsenic	62.7	---	4	85.1	Qualified parent sample as estimated UJ MS-L
Mercury	46.1 59.1 58.6	---	4	62.2	All biota mercury results qualified as estimated J/UJ MS-L
Zinc	---	155.8	4	114.7	Qualified parent sample as estimated J MS-H

The arsenic matrix spike recovery for sample TSS17-33-T01N-FW and the zinc recovery for sample TSS17-33-T01N-FU were outside evaluation criteria. Since only one out four recoveries were outside criteria for both samples, only the parent sample was qualified as estimated. The mercury matrix spike recoveries were outside criteria for three out of four matrix spikes, therefore, all biota mercury results were qualified as estimated (**J/UJ MS-L**).

4.1.4 Matrix Spike Results for Soil Samples

The table below illustrates the site-samples that were used to prepare soil matrix spike samples. As one metals and inorganic parameters MS was prepared and analyzed for 11 May 2004 field samples and three February 2004 field samples (excluding field duplicate samples) and one SPLP MS/MSD was prepared for six SPLP analyses, the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
TSS17-33-T01N-SOL	Soil	SOL102	Metals and Inorganic Parameters
MMW-50A-T03N-SOL 20:1	SPLP Leachate	L44850	Metals

Several soil matrix spike results were outside of the QC acceptance limits of 75%-125% for sample TSS17-33-T01N-SOL. The table below summarizes the outlying result and the resultant data qualification.

Analyte	Recoveries <75%	Recoveries >125%	Number of Valid Spike Results	Average MS %R	Action
Total Metals					
Antimony	10.9	---	1	10.9	All soil antimony results qualified as estimated (J/UJ MS-L)
Arsenic	55.6	---	1	55.6	All soil arsenic results qualified as estimated (J/UJ MS-L)
Barium	57.2	---	1	57.2	All soil barium results qualified as estimated (J/UJ MS-L)
Beryllium	70.6	---	1	70.6	All soil beryllium results qualified as estimated (J/UJ MS-L)
Boron	621	---	1	621	All soil boron results qualified as estimated (J/UJ MS-L)
Cadmium	67.7	---	1	67.7	All soil cadmium results qualified as estimated (J/UJ MS-L)
Chromium	51.0	---	1	51.0	All soil chromium results qualified as estimated (J/UJ MS-L)
Cobalt	66.1	---	1	66.1	All soil cobalt results qualified as estimated (J/UJ MS-L)
Copper	58.9	---	1	58.9	All soil copper results qualified as estimated (J/UJ MS-L)
Molybdenum	63.8	---	1	63.8	All soil molybdenum results qualified as estimated (J/UJ MS-L)
Nickel	62.9	---	1	62.9	All soil nickel results qualified as estimated (J/UJ MS-L)
Silver	69.8	---	1	69.8	All soil silver results qualified as estimated (J/UJ MS-L)
Vanadium	63.5	---	1	63.5	All soil vanadium results qualified as estimated (J/UJ MS-L)
Zinc	-17.8	---	1	-17.8	All soil zinc results qualified as estimated (J/UJ MS-L)
Inorganics					
TOC	73	---	1	73	Qualified parent sample as estimated (J MS-L).

Approximately 50% of the metal matrix spike recoveries were below evaluation criteria for sample TSS17-33-T01N-SOL. Therefore for the outlying analytes, all soil results were qualified as estimated (**J/UJ MS-L**).

For zinc, if the laboratory duplicate result had been used in the matrix spike recovery calculation, the matrix spike recovery would have been 47%, therefore, rejection of data was not considered necessary. For antimony, rejection of data was not considered necessary because the sample digestion conducted by the laboratory was not appropriate for this analyte. No further qualifications of data were necessary.

The MS and MSD recoveries for four analytes were outside the acceptance range on the SPLP leachate sample MMW-50A-T03N-SOL 20:1. The table below summarizes these results.

Analyte	MS%R or MS and MSD %R's	Comment	Action[1]
Calcium	19.0/ 19.1	Average percent recoveries less than 30.0%	Qualify parent sample R MS-L
Magnesium	33.3/ 33.8	Nondetect result for parent sample	Qualify parent sample UJ MS-L
Potassium	17/ 17.4	Average percent recoveries less than 30.0%	Qualify parent sample R MS-L
Sodium	17/ 17.5	Average percent recoveries less than 30.0%	Qualify parent sample R MS-L

Evaluation criteria MS % R 75 – 125 %

[1] Qualification was limited to the parent sample because the "T01N, "T02N" and "T03N" samples were collected from different depth intervals which had distinctly different geology and were therefore considered to be distinctly separate matrices.

Although both the MS and MSD recoveries were low for calcium, magnesium, potassium, and sodium, qualification was limited to the parent sample because the soil samples were collected from distinctly different type of geology than the May 2004 soils samples also included in this DVR.

4.2 LABORATORY DUPLICATE ANALYSES

The laboratory duplicate analyses are discussed by matrix. The groundwater, surface water, biota, and soil matrices are discussed in Sections 4.2.1, 4.2.2, 4.2.3 and 4.2.4 respectively.

4.2.1 Laboratory Duplicate Results for Groundwater Samples

The table below illustrates the site-samples that were used to prepare groundwater laboratory duplicate samples. As two LD were prepared and analyzed for 15 field samples (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample[1]	Matrix	Data Package	Analyses
DP-14-T01N-GRW	Groundwater	WAT295C	Metals and Inorganic Parameters
US-2-T01N-GRW	Groundwater	WAT296C	Metals and Inorganic Parameters

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

All groundwater laboratory duplicate results were within evaluation criteria. No qualifications of data were necessary.

4.2.2 Laboratory Duplicate Results for Surface Water Samples

The table below illustrates the site-samples that were used to prepare surface water laboratory duplicate samples. As one LD was prepared and analyzed for six field samples (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID[1]	Matrix	Data Package	Analyses
HUNT1-T01N-SFW	Surface water	WAT297S	Metals and Inorganic Parameters

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

One laboratory duplicate result was outside of the QC acceptance limit. The table below summarizes the outlying result and the resultant data qualification

Analyte	Sample ID	RPD or Absolute Difference as a Function of RL	Action
TSS	HUNT1-T01N-SFW	14.4 x RL	Qualified all surface water TSS results as estimated J/UJ D-I

4.2.3 Laboratory Duplicate Results for Biota Samples

The table below illustrates the site-samples that were used to prepare biota laboratory duplicate samples. As four LDs were prepared and analyzed for 52 field samples (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
TSS17-33-T01N-FU	Biota	BIO058	Metals
TSS17-33-T01N-FW	Biota	BIO058	Metals
TSS17-31-T01N-FU	Biota	BIO058	Metals
TSS17-31-T02N-FW	Biota	BIO059	Metals

All biota laboratory duplicate results were within evaluation criteria. No qualifications of data were necessary

4.2.4 Laboratory Duplicate Results for Soil Samples

The table below illustrates the site-samples that were used to prepare soil laboratory duplicate samples. As one metals and inorganic parameters LD was prepared and analyzed for 11 May 2004 field samples and three February 2004 field samples (excluding field duplicate samples) and two LDs were prepared for six SPLP leachate samples, the QAPP frequency for matrix QC samples (5%) was satisfied.

Sample ID	Matrix	Data Package	Analyses
TSS17-33-T01N-SOL	Soil	SOL102	Metals and Inorganic Parameters
MMW-50A-T02N-SOL 20:1	SPLP Leachate	L44850	Metals
MMW-50A-T03N-SOL 3:1	SPLP Leachate	L44850	Metals

All soil laboratory duplicate results were within evaluation criteria. No qualifications of data were necessary

4.3 SERIAL DILUTION EVALUATION

Serial dilution results are discussed by matrix. The groundwater, surface water, biota, and soil matrices are discussed in sections 4.3.1, 4.3.2, 4.3.3., and 4.3.4 respectively.

4.3.1 Serial Dilution Results for Groundwater Samples

The table below illustrates the site-samples that were used to prepare groundwater serial dilution samples. As two SD were prepared and analyzed for 15 field samples (excluding field duplicate samples), the frequency for serial dilution analyses samples was greater than 5%.

Sample ID[1]	Matrix	Data Package	Analyses
DP-14-T01N-GRW	Groundwater	WAT295C	Metals
US-2-T01N-GRW	Groundwater	WAT296C	Metals

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

The serial dilution analyses run on the matrix spikes of samples DP-14-T01N-GRW and DP-14-D01N-GRW were applicable for only 16 of the 24 analytes. The serial dilution analyses run on the matrix spikes of samples US-2-T01N-GRW and US-2-D01N-GRW were applicable for only 15 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less than 50x than the IDL, adjusted for dilution. The percent differences (between the initial and serial dilution results) were reviewed for any in excess of 10%. No qualification of groundwater data results was necessary.

4.3.2 Serial Dilution Results for Surface Water Samples

The table below illustrates the site-samples that were used to prepare surface water serial dilution (SD) samples. As one SD was prepared and analyzed for six field samples (excluding field duplicate samples), the frequency for serial dilution analyses was greater than 5%.

Sample ID[1]	Matrix	Data Package	Analyses
HUNT1-T01N-SFW	Surface water	WAT297S	Metals

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

The serial dilution analyses run on the matrix spikes of samples HUNT1-T01N-SFW and HUNT1-D01N-SFW were applicable for only 22 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less than 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. The cadmium result for sample HUNT1-T01N-SFW was slightly above criteria (10.1%). Since the percent difference rounds to 10%, no qualification of surface water data results was necessary.

4.3.3 Serial Dilution Results for Biota Samples

The table below illustrates the site-samples that were used to prepare biota serial dilution samples. As five SDs were prepared and analyzed for 52 field samples (excluding field duplicate samples), the frequency serial dilution analyses was greater than 5%.

Sample ID	Matrix	Data Package	Analyses
TSS17-33-T01N-FU	Biota	BIO058	Metals
TSS17-33-T01N-FW	Biota	BIO058	Metals
TSS17-31-T02N-FU	Biota	BIO058	Metals
TSS17-31-T02N-FW	Biota	BIO059	Metals
TSS17-39-T01N-FU	Biota	BIO060	Metals

A number of %Ds between the original sample results and the result obtained from a sample diluted 1:5 were >10%. In general, qualification was generally limited to the parent samples if less than a quarter of the valid serial dilution results for a given metal were outside of the acceptance range. Conversely, qualification was generally considered necessary if more than a quarter of the results for a metal were outside the acceptance range. Using professional judgment it was deemed necessary to only globally qualify results for outlying serial dilution if the average percent difference was $\geq$20%. The table below summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued.

Analyte	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		Action
				Low	High	
Potassium	5	5	19.9	1	0	J/UJ DL-L for all biota samples.
Zinc	5	1	7.3	1	0	J DL-L for parent sample (TSS17-31-T02N-FW)

Since 100% of the potassium serial dilution results were outside evaluation criteria, all biota potassium results were qualified as estimated (**J/UJ DL-L**). Only 20% of the zinc serial dilution

results were outside criteria with the average recovery at 7.3%. Only the parent sample was qualified as estimated for zinc (**J/UJ DL-L**).

4.3.4 Serial Dilution Results for Soil Samples

The table below illustrates the site-samples that were used to prepare soil serial dilution samples. As one SD was prepared and analyzed for 11 May 2004 field samples three February 2004 field samples (excluding field duplicate samples) and one SD was prepared and analyzed for six SPLP leachate samples, the frequency serial dilution analyses was greater than 5%.

Sample ID	Matrix	Data Package	Analyses
TSS17-33-T01N-SOL	Soil	SOL102	Metals
MMW-50A-T03N-SOL 20:1	SPLP Leachate	L44850	Metals

Two %Ds between the original sample results and the result obtained from a sample diluted 1:5 were >10%. In general, qualification was generally limited to the parent samples if less than a quarter of the valid serial dilution results for a given metal were outside of the acceptance range. Conversely, qualification was generally considered necessary if more than a quarter of the results for a metal were outside the acceptance range. Using professional judgment it was deemed necessary to only globally qualify results for outlying serial dilution if the average percent difference was $\geq$20%. The table below summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued.

Analyte	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		Action
				Low	High	
Potassium	1	1	26.2	1	0	J/UJ DL-L for all soil samples.
Zinc	1	1	13.3	1	0	J DL-L for parent sample (TSS17-31-T01N-SOL)

There was only one serial dilution sample analyzed for soils. Since the potassium result was 26.2%, all soil potassium results were qualified as estimated (**J/UJ DL-L**). The zinc serial dilution result was outside the evaluation criteria of 10% but was below 20%, therefore, only the parent sample was qualified as estimated (**J DL-L**).

None of the serial dilution results for MMW-50A-T03N-SOL 20:1 were applicable for evaluation potential matrix interferences.

The site-specific rinsate blanks and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤30% (≤50% for sediments) was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For field duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than two times the greater RL (<3.5xRL for sediments). For metals data, the CRDL is used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL and the IDL; the IDL was considered to be too low to be used as the baseline for these concentration dependent evaluations. With two exceptions, the applicable evaluation criterion was met. The exception and the resultant data qualifiers are summarized in the table below.

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations.

5.1 FIELD DUPLICATE EVALUATION

Field duplicate results are discussed by matrix. The groundwater, surface water, biota and soil matrices are discussed in Sections 5.1.1, 5.1.2, 5.1.3, and 5.1.4 respectively.

5.1.1 Field Duplicate Results for Groundwater Samples

Two groundwater field duplicate sample pairs were collected during this sampling event. As there were 15 field samples, the frequency of field duplicate collection satisfied the QAPP requirement of 5%. The field duplicate pairs are listed in the table below.

Sample ID	Matrix	Data Package	Analyses
DP-14-T01N-GRW/ DP-14-T01D-GRW	Groundwater	WAT295C	Metals and Inorganic Parameters
US-2-T01N-GRW/ US-2-T01D-GRW	Groundwater	WAT296C	Metals and Inorganic Parameters

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

All field duplicate RPD results satisfied the criteria specified in the QAPP. Therefore, no qualifications of groundwater data were necessary.

5.1.2 Field Duplicate Results for Surface Water Samples

One surface water field duplicate sample pair was collected during this sampling event. As there were 6 field samples, the frequency of field duplicate collection satisfied the QAPP requirement of 5%. The field duplicate pairs are listed in the table below.

Sample ID	Matrix	Data Package	Analyses
HUNT1-T01N-SFW/ HUNT1-T01N-SFW	Surface water	WAT297S	Metals and Inorganic Parameters

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

Three field duplicate %RPD results were above the criteria specified in the QAPP. The table below summarizes outlying field duplicate results and the resultant data qualification issued.

Analyte	Sample ID	RPD or Absolute Difference as a Function of RL	Action
TSS	HUNT1-T01N-SFW/ HUNT1-T01D-SFW	13.6 x RL	Qualified all surface water TSS results as estimated J/UJ FD-I.
Chloride	HUNT1-T01N-SFW/ HUNT1-T01D-SFW	RPD-79.5%	Qualified all surface water chloride results as estimated J/UJ FD-I.
Nitrate	HUNT1-T01N-SFW/ HUNT1-T01D-SFW	33 x RL	Qualified all surface water Nitrate results as estimated J/UJ FD-I.

RL = Reporting Limit RPD = Relative Percent Difference

The field duplicate results were outside evaluation criteria for TSS, chloride, and nitrate. All surface water TSS, chloride and nitrate results were qualified as estimated (**J/UJ FD-I**).

5.1.3 Field Duplicate Results for Biota Samples

Seven biota field duplicate sample pairs were collected during this sampling event. As there were 52 field samples, the frequency of field duplicate collection satisfied the QAPP requirement of 5%. The field duplicate pairs are listed in the table below.

Sample ID	Matrix	Data Package	Analyses
TSS17-33-T02N-GU/ TSS17-33-T02D-GU	Biota	BIO058	Metals and Inorganic Parameters
TSS17-33-T02N-FU/ TSS17-33-T02D-FU	Biota	BIO058	Metals and Inorganic Parameters
TSS17-33-T02N-GW/ TSS17-33-T02D-GW	Biota	BIO058	Metals and Inorganic Parameters
TSS17-31-T01N-FW/ TSS17-31-T01D-FW	Biota	BIO059	Metals and Inorganic Parameters
TSS17-41-T02N-FU/ TSS17-41-T02D-FU	Biota	BIO059	Metals and Inorganic Parameters
TSS17-39-T01N-FW/ TSS17-39-T01D-FW	Biota	BIO059	Metals and Inorganic Parameters
TSS17-37-T02N-GW/ TSS17-37-T02D-GW	Biota	BIO060	Metals and Inorganic Parameters

One field duplicate RPD result was above the criteria specified in the QAPP. The table below summarizes outlying field duplicate results and the resultant data qualification issued.

Analyte	Sample ID	Criterion	Action
Iron	TSS17-31-T02N-FU/ TSS17-31-T02N-FU	AD= >4 x RL	J FD-I for affected field duplicate samples only

AD = Absolute Difference

Since only one out of seven iron field duplicate results were outside evaluation criteria, only the parent and duplicate sample results were qualified as estimated (**J/UJ FD-I**).

5.1.4 Field Duplicate Results for Soil Samples

One soil field duplicate sample pair was collected during this sampling event. As there were 11 May 2004 field samples and three February 2004 field samples, the frequency of field duplicate collection satisfied the QAPP requirement of 5%. The field duplicate pairs are listed in the table below.

Sample ID	Matrix	Data Package	Analyses
TSS17-33-T01N-SOL/ TSS17-33-T01D-SOL	Soil	SOL102	Metals and Inorganic Parameters

All soil field duplicate results were within evaluation criteria, there for no qualifications of data were necessary.

5.1.5 Groundwater Rinsate Blank Results

One groundwater rinsate blank was collected during this sampling event. The rinsate blank was given the field ID of RB01T-GRW. As there were 15 samples, the frequency of rinsate blank collection satisfied the QAPP requirement. The groundwater sampling event rinsate samples were submitted for analysis with other aqueous samples collected as part of the overall remedial investigation program. The validation of this data is included in the data validation reports for the data packages in which they are reported. The table below summarizes the detected rinsate blank results.

MAY 2004 SOUTH OF TAILINGS INVESTIGATION GROUNDWATER RINSATE BLANK RESULTS

Analyte	Sample ID	Conc.	RL	Frequency of Detection	Average RB Concentration	Range for Field Samples	Action
Inorganic Parameters (mg/L)							
Bicarbonate alkalinity	RB01T-GRW	3.0	1.0	1 of 1	3.0	32.1 mg/L to 358 mg/L	None, sample results were >5x RB concentration
Total alkalinity	RB01T-GRW	3.0	1.0	1 of 1	3.0	32.1 mg/L to 358 mg/L	None, sample results were >5x RB concentration
TDS	RB01T-GRW	11	5.0	1 of 1	11	114 mg/L to 1690 mg/L	None, sample results were >5x RB concentration
TOC	RB01T-GRW	2.4	1.0	1 of 1	2.4	1.0 mg/L to 21.9 mg/L	Qualified sample results ≤ 12.0 mg/L U RB-I.

ND = Nondetect MDL = Method Detection Limit RL = Reporting Limit

While some results were qualified as nondetect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and detections were at low levels.

5.1.6 Surface Water Rinsate Blank Results

One surface water rinsate blank was collected during this sampling event. The rinsate blank was given field ID of RB01T-SFW. As there were 6 samples, the frequency of rinsate blank collection satisfied the QAPP requirement. The surface water sampling event rinsate sample was submitted for analysis with other aqueous samples collected as part of the overall remedial investigation program. The validation of this data is included in the data validation reports for the data packages in which they are reported. All results for rinsate blank sample RB01T-SFW were nondetect, therefore, no qualifications of data were necessary.

5.1.7 Biota Rinsate Blank Results

Six rinsate blanks were collected during this sampling event. Two rinsate blanks were for the washed plants (RB01T-WASH and RB02T-WASH), and four rinsate blanks were for the unwashed plants (RB01T-PLT, RB02T-PLT, RB03T-PLT, and RB04T-PLT). As there were 52 samples, the frequency of rinsate blank collection satisfied the QAPP requirement. The biota

sampling event rinsate samples were submitted for analysis with other aqueous samples collected as part of the overall remedial investigation program. The validation of this data is included in the data validation reports for the data packages in which they are reported. The table below summarizes the detected rinsate blank results.

MAY 2004 SOUTH OF TAILINGS INVESTIGATION
BIOTA RINSATE BLANK RESULTS

Analyte	Sample ID	Conc. µg/L	RL µg/L	Frequency of Detection	Average RB Concentration µg/L	Range for Field Samples
UNWASHED						
Chromium	RB02T-PLT	0.84	0.6	3 of 4	0.647	0.17 mg/kg to 10.4 mg/kg
	RB03T-PLT	0.71				
	RB04T-PLT	0.74				
Vanadium	RB02T-PLT	0.42	0.4	2 of 4	0.317	0.13 mg/kg to 17.6 mg/kg
	RB03T-PLT	0.45				
WASHED						
Boron	RB01T-WASH	6.9	3.6	1 of 2	4.35	0.7 mg/kg to 8.7 mg/kg
Manganese	RB02T-WASH	15.1	14	1 of 2	11.1	4.2 mg/kg to 205 mg/kg
Potassium	RB01T-WASH	1780	363	2 of 2	1279.5	1640 mg/kg to 7790 mg/kg
	RB02T-WASH	779				
Vanadium	RB02T-WASH	0.62	04	1 of 2	0.41	0.12 mg/kg to 2.9 mg/kg

It is considered that low level of detected concentrations for these analytes in the plant samples may be attributable to contamination. Evaluation of the range of detected concentrations for each analyte reported in the rinsate blank samples provides an indication of the reasonable maximum likely contribution for each of these analytes. A conservative approach for calculating equivalent concentrations was undertaken. This was based on the assumption that all contamination found in the blank aliquot analyzed would also be present in the sample aliquot analyzed. In addition, considering the different environmental and rinsate blank preparation procedures, the maximum likely contributions for the detected analytes would be minimal.

Due to relative consistency and low levels of contaminations observed, no data was qualified on the basis of rinsate blank results. It is considered that these results are not indicative of systematic contamination.

5.1.8 Soil Rinsate Blank Results

One rinsate blank was collected during this sampling event. As there were 11 May 2004 field samples and three February 2004 field samples, the frequency of rinsate blank collection satisfied the QAPP requirement. The soil sampling event rinsate sample were submitted for analysis with other aqueous samples collected as part of the overall remedial investigation program. The validation of this data is included in the data validation reports for the data packages in which they are reported. The table below summarizes the detected rinsate blank results.

MAY 2004 SOUTH OF TAILINGS INVESTIGATION
SOIL RINSATE BLANK RESULTS

Analyte	Sample ID	Conc. µg/L	RL µg/L	Frequency of Detection	Average RB Concentration µg/L	Range for Field Samples
Metals (ug/L)						
Chromium	RB01T-SOL	4.6	0.6	1 of 1	4.6	11.3 mg/kg to 30.4 mg/kg (dry)
Inorganics (mg/L)						
Ammonia	RB01T-SOL	0.075	0.04	1 of 1	0.075	38.4 mg/kg to 531 mg/kg (dry)
Chloride	RB01T-SOL	0.51	0.2	1 of 1	0.51	9.3 mg/kg to 99.9 mg/kg (dry)

It is considered that low level of detected concentrations for these analytes in the soil samples may be attributable to contamination. Evaluation of the range of detected concentrations for each analyte reported in the rinsate blank samples provides an indication of the reasonable maximum likely contribution for each of these analytes. A conservative approach for calculating equivalent concentrations was undertaken. This was based on the assumption that all contamination found in the blank aliquot analyzed would also be present in the sample aliquot analyzed, and taking into account the differing environmental and rinsate blank preparation procedures, the maximum likely potential contributions to soil sample concentrations are: 0.541 mg/kg-dry for chromium, 0.018 mg/kg for ammonia and 0.0006 mg/kg for chloride. An average % solids of 85% was used in these calculations. It is considered that these results are not indicative of systematic contamination because these calculated maximum possible contributions to sample concentrations are less than the lowest detected sample result. No data have been qualified on the basis of the tailing material rinsate blank results.

Due to relative consistency and low levels of contaminations observed, no data was qualified on the basis of rinsate blank results. It is considered that these results are not indicative of systematic contamination.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank contamination. Some sample results were qualified as estimated on the basis of the LCS or MS/MSD results or holding time exceedances. A general overall assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

All of the groundwater field duplicate and laboratory duplicate results satisfied the applicable criteria. Approximately 92% of the surface water field duplicate results and all of the surface water laboratory duplicate results satisfied the applicable criteria. Approximately 96% of the biota field duplicate results and all of the biota laboratory duplicate results satisfied the applicable criteria. All of the soil field duplicate and laboratory duplicate results satisfied the applicable criteria. As such, the overall level of precision demonstrated is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery of LCSs and MS/MSDs.

All of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP, which is considered to be indicative of acceptable overall accuracy with respect to the analytical system.

Excluding the SPLP analyses on MMW-50A-T01N-SOL, the MS spike recoveries suggested that the overall accuracy attained with respect to the site-specific sample matrix is satisfactory as 99% of the groundwater matrix spike recoveries, all of the surface water matrix spike recoveries, and 95% of the biota matrix spike recoveries. were within the QAPP acceptance range of 75-125%. For the soil, only 38% of matrix spike recoveries were within criteria with the average spike recovery for all metals analytes being 53%, suggesting that the soil sample matrices were in-homogeneous at the sampling locations at these sites. Associated soil sample results were qualified as estimated. Three of the 150 SPLP sample results were qualified as unusable based on matrix spike recoveries <30%.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results for the groundwater, surface water, biota and soil samples analyzed are considered usable as qualified for meeting project objective. As such, the completeness for the groundwater, surface water, biota, and soil samples was 100% which satisfies the QAPP completeness goal of 80%. The analytical completeness for the SPLP results, however, was only 98% as three results were rejected based on matrix spike results.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the samples. The close agreement between the field duplicate results is considered to indicate that the samples collected are adequately representative of the medium sampled. Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. As noted in Section 6.1, the laboratory duplicate results satisfied the precision evaluation indicating that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

All RLs obtained met the QAPP specified RL requirements for solid media for which there was screening level criteria provided in the QAPP or the Baseline Ecological Risk Assessment to which RLs for nondetect analytes could be compared.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT294C

Sampling Event: Supplemental Sampling South of Tailings

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike

Date Completed: 06/10/04

Peer Reviewer: Stacey Coker

Date Completed: 06/20/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics
RB01T-SOL	RB	570080		W	X	X
RB01T-WASH	RB	570336		W	X	
RB02T-WASH	RB	570337		W	X	
RB01T-PLT	RB	570338		W	X	
RB02T-PLT	RB	570339		W	X	
RB03T-PLT	RB	570340		W	X	
RB04T-PLT	RB	570341		W	X	
DP-13-T01N-GRW	SA	570342		W	X	X
DP-13-D01N-GRW	SA	570343		W	X	
DP-7-T01N-GRW	SA	570344		W	X	X
DP-7-D01N-GRW	SA	570345		W	X	
DP-4-T01N-GRW	SA	570346		W	X	X
DP-4-D01N-GRW	SA	570347		W	X	

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	For sample RB01T-SOL the initial nitrate analysis by method 300.0 was accomplished within holding time. Since the sample analysis was not within control criteria, the sample was reanalyzed one day outside of holding time with acceptable results. The nitrate result for sample RB01T-SOL was qualified as estimated (**UJ**) due to exceedance of holding time. The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 15-17 days after sampling and 13 days beyond log-in. The pH for the same samples were measured approximately 1-2 days beyond sampling. Therefore, all conductivity and pH results were qualified as estimated (**J**). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Chloride was detected in the method blank run on 05/07/04. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • LD	NA	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the Supplemental Sampling South of Tailings sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) RB01T-SOL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses run on sample RB01T-SOL. This is a rinsate blank sample and is not considered appropriate for serial dilution evaluation. No qualifications of data were necessary. The serial dilution results for the Supplemental Sampling South of Tailings sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances
Field QC • Field Duplicate • Rinsate Blank RB01T-SOL RB01T-WASH RB02T-WASH RB01T-PLT RB02T-PLT RB03T-PLT RB04T-PLT	Yes	Table 1.3 lists the rinsate blank detections remaining after evaluating results for laboratory procedural blanks (i.e. method blanks and calibration blanks). The field QC results for the Supplemental Sampling South of Tailings sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	No	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS) All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Cond. (µmhos/cm)	PH (std units)
RB01T-SOL	0.20 UJ	5.0 UJ	6.0 J
DP-13-T01N-GRW		874 J	7.7 J
DP-7-T01N-GRW		1700 J	7.5 J
DP-4-T01N-GRW		1480 J	7.4 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Chloride 05/07/04					0.32mg/L	0.20	RB01T-SOL	U MB-I
Antimony DF=2	1.3	1.3	1.3	1.3	2.435		All samples in this SDG	U CCB,MB-I
Beryllium DF=1	0.3	---	---	---	-0.538		All samples in this SDG	J/UJ MB-L
Nickel DF=1	---	---	---	---	-2.815		DP-13-D01N-GRW DP-4-D01N-GRW DP-7-D01N-GRW DP-7-T01N-GRW RB01T-PLT RB01T-SOL RB01T-WASH RB02T-PLT RB02T-WASH RB03T-PLT RB04T-PLT	J/UJ MB-L
Silver DF=2	-0.2	-0.2	-0.2	-0.2	-0.317		All samples in this SDG	UJ CCB, MB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Sodium DF=10	-474.4	---	-332.9	---	-3362.0		RB01T-PLT RB01T-SOL RB01T-WASH RB02T-PLT RB02T-WASH RB03T-PLT RB04T-PLT	UJ CCB,MB-L
Zinc DF=10	-4.9	-6.5	---	-6.6			All samples in this SDG	J/UJ CCB-L

CV = Cold Vapor MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL = IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Rinsate Blank Detections

Analyte	RL (ug/L)	Concentration (ug/L)
RB01T-SOL		
Ammonia	0.040	0.075
Chromium	0.60	4.6
RB01T-WASH		
Boron	3.6	6.9
Potassium	363.4	1780
RB02T-PLT		
Chromium	0.60	0.84
Vanadium	0.20	0.42
RB02T-WASH		
Manganese	1.4	15.1
Potassium	363.4	779
Vanadium	0.20	0.62
RB03-PLT		
Chromium	0.60	0.71
Vanadium	0.20	0.45
RB04PLT		
Chromium	0.60	0.74

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT295C

Sampling Event: Supplemental Sampling South of Tailings

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike

Date Completed: 06/14/04

Peer Reviewer: Stacey Coker

Date Completed: 06/20/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics
DP-14-T01N-GRW	SA, MS, LD	570206		W	X	X
DP-14-D01N-GRW	SA, MS, LD	570207		W	X	
DP-14-T01D-GRW	FD	510208		W	X	X
DP-14-D01D-GRW	FD	570209		W	X	
DP-10-T01N-GRW	SA	570210		W	X	X
DP-10-D01N-GRW	SA	570211		W	X	
RB01T-GRW	RB	570212		W	X	X
RB01D-GRW	RB	570213		W	X	
DP-12-T01N-GRW	SA	570214		W	X	X
DP-12-D01N-GRW	SA	570215		W	X	
DP-11-T01N-GRW	SA	570216		W	X	X
DP-11-D01N-GRW	SA	570217		W	X	
DP-6-T01N-GRW	SA	570218		W	X	X
DP-6-D01N-GRW	SA	570219		W	X	
DP-9-T01N-GRW	SA	570220		W	X	X
DP-9-D01N-GRW	SA	570221		W	X	
DP-5-T01N-GRW	SA	570222		W	X	X
DP-5-D01N-GRW	SA	570223		W	X	
DP-8-T01N-GRW	SA	570224		W	X	X
DP-8-D01N-GRW	SA	570225		W	X	

Matrix: W = Water

QC Type: SA = Sample FD = Field Duplicate MS = Matrix Spike LD = Laboratory Duplicate RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	For samples DP-12-D01N-GRW, DP-11-D01N-GRW, DP-6-D01N-GRW, DP-12-T01N-GRW, DP-11-T01N-GRW and DP-6-T01N-GRW, the sample dates were not listed on the COC. The laboratory logged in the sample dates per the collection dates listed on the sample labels.
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 15 days after sampling. The pH for the same samples were measured approximately 2 days beyond sampling. Therefore, all conductivity and pH results were qualified as estimated (**J**). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Chloride was detected in the method blank run on 05/07/04. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD DP-14-T01N-GRW DP-14-D01N-GRW • LD DP-14-T01N-GRW DP-14-D01N-GRW	No	The laboratory case narrative stated that the matrix spike recovery for TOC was outside evaluation criteria. Upon review of the data, the TOC matrix spike result was 100%. No qualifications of data were necessary. All laboratory duplicate %RPDs were within evaluation criteria, therefore, no qualifications of data were necessary. The matrix quality control results for the Supplemental Sampling South of Tailings sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) DP-14-T01N-GRWSL DP-14-D01N-GRWSL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses run on the matrix spikes of samples DP-14-T01N-GRW and DP-14-D01N-GRW were applicable for only 16 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. No qualification of data results was necessary. The serial dilution results for the Supplemental Sampling South of Tailings sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. For samples DP-5-T01N-GRW and DP-8-T01N-GRW, the anion/cation balance was outside acceptance criteria. The percent differences were -21.97% and -17.74% respectively, outside the acceptance range of ±13%. Evaluations of historical data relative to the sulfate ion concentration indicates that the sulfate results were likely biased high. Therefore the sulfate results for these samples were qualified as estimated (**J**). A qualification of "TvP-H" was assigned. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate 01N-GRW/DP-14-T01D-GRW 01N-GRW/DP-14-D01D-GRW • Rinsate Blank RB01T-GRW RB01D-GRW	Yes	All field duplicate results were within acceptance criteria, therefore, no qualifications of data were necessary. The field QC results for the Supplemental Sampling South of Tailings sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Cond. (µmhos/cm)	PH (std units)
DP-14-T01N-GRW	448J	7.1J
DP-14-T01D-GRW	448J	7.1J
DP-10-T01N-GRW	1340J	7.4J
RB01T-GRW	5.0 UJ	7.4J
DP-12-T01N-GRW	370J	7.2J
DP-11-T01N-GRW	595J	7.3J
DP-6-T01N-GRW	744J	7.7J
DP-9-T01N-GRW	1850J	7.0J
DP-5-T01N-GRW	1130J	7.0J
DP-8-T01N-GRW	1220J	7.4J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Chloride	---	---	---	---	0.32 mg/L	0.20	RB01T-GRW	U MB-I
Antimony DF=2	-0.4	-0.4	-0.5	-0.4	-0.942		All samples in this SDG	UJ CCB, MB-L
Beryllium	0.4	0.4	0.4	0.6	---		DP-10-D01N-GRW DP-10-T01N-GRW DP-11-D01N-GRW DP-11-T01N-GRW DP-12-D01N-GRW DP-12-T01N-GRW DP-14-D01N-GRW DP-14-T01N-GRW DP-5-D01N-GRW DP-5-T01N-GRW DP-6-D01N-GRW DP-6-T01N-GRW DP-8-D01N-GRW DP-8-T01N-GRW DP-9-D01N-GRW DP-9-T01N-GRW RB01D-GRW RB01T-GRW	U CCB-I
Cadmium DF=1	0.4	0.9	---	---	0.972		DP-10-D01N-GRW DP-10-T01N-GRW DP-12-D01N-GRW DP-12-T01N-GRW DP-14-D01D-GRW DP-14-D01N-GRW DP-14-T01D-GRW DP-14-T01N-GRW RB01T-GRW	U CCB,MB-I
							DP-11-D01N-GRW DP-11-T01N-GRW DP-5-D01N-GRW DP-5-T01N-GRW DP-6-T01N-GRW DP-8-D01N-GRW DP-8-T01N-GRW DP-9-D01N-GRW DP-9-T01N-GRW	U MB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Chromium DF=1	---	2.0	-1.5	---	1.154		DP-10-D01N-GRW DP-10-T01N-GRW DP-11-D01N-GRW DP-11-T01N-GRW DP-12-D01N-GRW DP-14-T01D-GRW DP-5-D01N-GRW DP-6-D01N-GRW DP-6-T01N-GRW DP-9-D01N-GRW DP-9-T01N-GRW RB01D-GRW	UJ CCB,MB-I
							DP-14-D01D-GRW DP-8-D01N-GRW RB01T-GRW	UJ CCB-L
							DP-14-D01N-GRW DP-14-T01N-GRW	U CCB, MB-I
Cobalt DF=1	---	2.3	---	1.3	---		DP-10-D01N-GRW DP-10-T01N-GRW DP-11-D01N-GRW DP-11-T01N-GRW DP-12-T01N-GRW DP-14-D01D-GRW DP-14-T01N-GRW DP-5-D01N-GRW DP-6-T01N-GRW DP-8-D01N-GRW DP-8-T01N-GRW DP-9-D01N-GRW DP-9-T01N-GRW	U CCB-I
Copper DF=1	---	4.7	-2.1	---	4.291		DP-10-D01N-GRW DP-10-T01N-GRW DP-11-D01N-GRW DP-11-T01N-GRW DP-12-D01N-GRW DP-14-D01D-GRW DP-14-D01N-GRW DP-14-T01D-GRW DP-5-D01N-GRW DP-5-T01N-GRW DP-6-D01N-GRW DP-6-T01N-GRW DP-8-D01N-GRW RB01D-GRW RB01T-GRW	UJ CCB,MB-I
							DP-12-T01N-GRW DP-14-D01N-GRW DP-14-T01N-GRW	U CCB,MB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
							DP-9-D01N-GRW DP-9-T01N-GRW	U MB-I
Mercury DF=1	-0.1	-0.1	---	---	---		DP-10-D01N-GRW DP-10-T01N-GRW DP-11-D01N-GRW DP-11-T01N-GRW DP-12-D01N-GRW DP-12-T01N-GRW DP-14-D01D-GRW DP-14-D01N-GRW DP-14-T01D-GRW DP-14-T01N-GRW RB01D-GRW RB01T-GRW	UJ CCB-L
Molybdenum DF=1	-1.6	-2.1	-1.8	-1.6	-3.123		RB01D-GRW RB01T-GRW	UJ CCB,MB-L
Silver DF=2	-0.2	-0.2	-0.2	-0.2	-0.353		All samples in this SDG	UJ CCB, MB-L
Nickel DF=1	---	---	-1.6	---	---		DP-10-D01N-GRW DP-10-T01N-GRW DP-11-D01N-GRW DP-11-T01N-GRW DP-12-D01N-GRW DP-14-D01D-GRW DP-14-T01D-GRW DP-6-D01N-GRW DP-8-D01N-GRW RB01D-GRW RB01T-GRW	UJ CCB-L
							DP-5-D01N-GRW DP-5-T01N-GRW DP-6-T01N-GRW DP-9-D01N-GRW DP-9-T01N-GRW	J CCB-L
Potassium DF=1	---	233.3	250.4	-719.4	845.8		DP-11-D01N-GRW DP-11-T01N-GRW DP-6-D01N-GRW DP-6-T01N-GRW	UJ CCB,MB-I
							DP-14-D01D-GRW DP-14-D01N-GRW DP-14-T01D-GRW DP-14-T01N-GRW	U MB-I
							RB01D-GRW RB01T-GRW	U CCB,MB-I

CV = Cold Vapor MS = Mass Spect P= ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT296C

Sampling Event: Supplemental Sampling South of Tailings

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike

Date Completed: 06/15/04

Peer Reviewer: Stacey Coker

Date Completed: 06/20/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics
SPRING8-T01N-GRW	SA	570399		W	X	X
SPRING8-D01N-GRW	SA	570400		W	X	
SPRING7-T01N-GRW	SA	570401		W	X	X
SPRING7-D01N-GRW	SA	570402		W	X	
RB06T-SOL	RB	570403		W	X	
RB02T-SOL	RB	570829		W	X	
RB03T-S0L	RB	570830		W	X	
RB04T-SOL	RB	570831		W	X	
RB05T-SOL	RB	570832		W	X	
RB01T-SOL[2]	RB	570833		W	X	
RB07T-SOL	RB	571238		W	X	
US-2-T01N-GRW	SA,MS	571239		W	X	X
US-2-D01N-GRW	SA, MS	571240		W	X	
US-2-T01D-GRW	FD	571241		W	X	X
US-2-D01D-GRW	FD	571242		W	X	
RB02T-GRW	RB	571243		W	X	X
RB02D-GRW	RB	571244		W	X	
US-3-T01N-GRW	SA	571245		W	X	X
US-3-D01N-GRW	SA	571246		W	X	
RB01T-SED	RB	571399		W	X	

Matrix: W = Water

QC Type: SA = Sample RB=Rinsate Blank FD= Field duplicate MS= Matrix Spike

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Analyzed for cyanide only

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: The following issues, potentially affecting the quality or usability of the data, were noted in the laboratory case narrative.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 9-14 days after sampling and 7-12 days beyond log-in. The pH for the same samples were measured approximately 2-3 days beyond sampling. Therefore, all conductivity and pH results were qualified as estimated (**J/UJ**). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Chloride was detected in the method blank run on 05/08/04. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD US-2-T01N-GRWMS US-2-D01N-GRWMS • LD US-2-T01N-GRWREP US-2-D01N-GRWREP	No	The laboratory duplicate RPD was outside criteria (1XRL) for ammonia in sample US-2-T01N-GRW. The ammonia result for sample US-2-T01N-GRW was qualified as estimated (**J D-I**). The matrix spike sample US-2-T01N-GRW, the iron recovery was above evaluation criteria (130.4%). Since the sample result was nondetect, no qualifications of data were necessary. The matrix quality control results for the Supplemental Sampling South of Tailings sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution (C) US-2-T01N-GRWSL US-2-D01N-GRWSL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses run on the matrix spikes of samples US-2-T01N-GRW and US-2-D01N-GRW were applicable for only 15 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. No qualification of data results was necessary. The serial dilution results for the Supplemental Sampling South of Tailings sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate US-2-T01N-GRW/US-2-T01D-GRW US-2-D01N-GRW/US-2-D01D-GRW • Rinsate Blank RB01T-SOL RB02T-SOL RB03T-SOL RB04T-SOL RB05T-SOL RB06T-SOL RB07T-SOL RB01T-SED	Yes	All field duplicate results were within evaluation criteria, therefore, no qualifications of data were necessary. Table 1.3 lists the rinsate blank detections remaining after evaluating results for laboratory procedural blanks (i.e. method blanks and calibration blanks). The field QC results for the Supplemental Sampling South of Tailings sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS) All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Cond. (µmhos/cm)	PH (std units)
SPRING8-T01N-GRW	614 J	7.3 J
SPRING7-T01N-GRW	1440 J	7.4 J
RB06T-SOL	5.0 UJ	6.5 J
RB02T-SOL	5.0 UJ	5.0 J
RB03T-SOL	5.0 UJ	5.6 J
RB04T-SOL	5.0 UJ	5.9 J
RB05T-SOL	5.0 UJ	5.7 J
RB07T-SOL	5.0 UJ	6.8 J
US-2-T01N-GRW	284 J	6.5 J
US-2-T01D-GRW	293 J	6.5 J
RB02T-GRW	5.0 UJ	6.4 J
US-3-T01N-GRW	194 J	7.2 J
RB01T-SED	5.0 UJ	6.2 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Chloride 5/13/04	---	0.20	---	---	---	0.20	RB07T-SOL	U CCB-I
Aluminum DF=10	32.2	44.2	---	---	---	17.6	US-2-T01N-GRW US-2-D01N-GRW SPRING7-T01N-GRW	U CCB-I
Beryllium DF=1	---	0.6	0.8	1.1	-0.594	0.3	SPRING7-D01N-GRW RB06T-SOL RB02T-SOL RB03T-SOL RB04T-SOL RB05T-SOL RB07T-SOL US-2-T01N-GRW US-2-D01N-GRW US-2-T01D-GRW US-2-D01D-GRW RB02T-GRW RB02D-GRW US-3-T01N-GRW RB01T-SED	UJ MB,CCB-I
							US-3-D01N-GRW SPRING8-T01N-GRW SPRING8-D01N-GRW SPRING7-T01N-GRW	UJ MB-L

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Chromium DF=1	0.7	---	---	---	0.761	0.6	SPRING8-T01N-GRW SPRING8-D01N-GRW SPRING7-T01N-GRW RB06T-SOL RB03T-SOL	U MB, CCB-I
							RB05T-SOL RB07T-SOL US-2-T01N-GRW RB02T-GRW RB02D-GRW US-3-D01N-GRW RB01T-SED	U MB-I
Iron DF=10	29.7	31.8	22.6	---	--	19.2	SPRING8-T01N-GRW SPRING7-T01N-GRW SPRING7-D01N-GRW	U CCB-I
Sodium DF=10	---	---	245.1	---	---	172.6	US-2-T01N-GRW US-2-D01N-GRW US-2-T01D-GRW US-2-D01D-GRW US-3-T01N-GRW US-3-D01N-GRW	U CCB-I

CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Rinsate Blank Detections

Analyte	RL (ug/L)	Concentration (ug/L)
RB06T-SOL		
Chloride	0.20	0.28
Ammonia	0.40	0.040
Potassium	363.4	488
RB02T-SOL		
Chloride	0.20	0.22
Molybdenum	1.4	1.4
Potassium	363.4	575
RB03T-SOL		
Chloride	0.20	0.28
RB04T-SOL		
Chloride	0.20	0.23
RB05T-SOL		
Ammonia	0.040	0.040
Zinc	1.5	16.0
RB07T-SOL		
Ammonia	0.040	0.099

Table 1.3
Rinsate Blank Detections

Analyte	RL (ug/L)	Concentration (ug/L)
RB02T-GRW		
TSS	10.0	18.0
Bicarbonate Alkalinity	1.0	2.8
Total Alkalinity	1.0	2.8
Ammonia	0.040	0.16
Molybdenum	1.4	1.6
RB01T-SED		
Chloride	0.20	0.26
Ammonia	0.040	0.091

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT297S

Sampling Events: Supplemental Sampling South of Tailings and Hunts Pond

Matrix: Solid ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Jennifer Winnike

Date Completed: 06/17/04

Peer Reviewer: Stacey Coker

Date Completed: 06/28/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics
LR6-T01N-SFW	SA	570404		W	X	X
LR6-D01N-SFW	SA	570405		W	X	
LR4-T01N-SFW	SA	570406		W	X	X
LR4-D01N-SFW	SA	570407		W	X	
LR-4U-T01N-SFW	SA	570408		W	X	X
LR-4U-D01N-SFW	SA	570409		W	X	
GARDEN1-T01N-IRW	SA	570410		W	X	X
GARDEN1-D01N-IRW	SA	570411		W	X	
HUNT2-T01N-SFW	SA	571230		W	X	X
HUNT2-D01N-SFW	SA	571231		W	X	
HUNT1-T01N-SFW	SA, MS, LD	571232		W	X	X
HUNT1-D01N-SFW	SA, MS, LD	571233		W	X	
HUNT1-T01D-SFW	FD	571234		W	X	X
HUNT1-D01D-SFW	FD	571235		W	X	
RB01T-SFW	RB	571236		W	X	X
RB01D-SFW	RB	571237		W	X	

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank FD = Field Duplicate MS = Matrix Spike LD = Laboratory Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	The laboratory case narrative indicated that the bottles for cyanide analysis were received at a reduced pH despite field pH checks that indicated the pH was ≥ 12. As such, the laboratory added NaOH pellets to cyanide samples LR6-T01N-SFW, LR4-T01N-SFW, LR-4U-T01N-SFW and GARDEN1-T01N-IRW. However, the cyanide results for these samples were qualified as estimated (**J P-I**) because the pH upon receipt was not correct.
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 9-14 days after sampling and 7-12 days beyond log-in. The pH for the same samples were measured approximately 2-3 days beyond sampling. Therefore, all conductivity and pH results were qualified as estimated (**J/UJ**). The BOD analyses were analyzed 1 day beyond holding time. Therefore all BOD results were qualified as estimated (**J/UJ**). Table 1.1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Chloride was detected in the method blank run on 05/08/04. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD HUNT1-T01N-SFWMS HUNT1-D01N-SFWMS • LD HUNT1-T01N-SFWD HUNT1-D01N-SFWD	No	The RPD between the laboratory duplicate results was outside the applicable evaluation criterion (absolute difference was 14.4 x RL) for TSS in sample HUNT1-T01N-SFW. The TSS result for sample HUNT1-T01N-SFW was qualified as estimated (**J D-I**). For matrix spike sample HUNT1-T01N-SFW, the ammonia recovery was below evaluation criteria (67%). Therefore, the ammonia result for sample HUNT1-T01N-SFW was qualified as estimated (**J MS-L**). The matrix quality control results for the Supplemental Sampling South of Tailings and Hunts Pond sampling events will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution HUNT1-T01N-SFWSL HUNT1-D01N-SFWSL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses run on the matrix spikes of samples HUNT1-T01N-SFW and HUNT1-D01N-SFW were applicable for only 22 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. The cadmium result for sample HUNT1-T01N-SFW was slightly above criteria (10.1%). Since the percent difference rounds to 10%, no qualifications of data were necessary. The serial dilution results for the Supplemental Sampling South of Tailings and Hunts Pond sampling events will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion, with the exception of rinsate blank sample RB01*-SFW, which reported a cation/ anion % difference of -73.87%. As the concentrations were low enough that the reporting limits controlled the calculations, the cation/anion % difference was not considered representative of this comparison and therefore did not result in data qualification. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate HUNT1-T01D-SFW HUNT1-D01D-SFW • Rinsate Blank RB01T-SFW RB01D-SFW	Yes	All field duplicate results were within evaluation criteria except for the RPDs between the TSS, chloride and nitrate results for samples HUNT1-T01N-SFW and HUNT1-T01D-SFW. Table 1.3 summarizes the outlying field duplicate results and the resultant data qualifications. The field QC results for the Supplemental Sampling South of Tailings and Hunts Pond sampling events will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.
Initial Calibration	Yes	
Continuing Calibration	Yes	
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	N/A	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken. The IDL initially reported for molybdenum was 0.00 µg/L. The laboratory was contacted for an explanation. Upon investigation, the laboratory discovered that the molybdenum results initially reported were quantitated based on the wrong isotope, which is why the IDL registered as 0.00 on the Form. The laboratory submitted revised reporting forms (i.e. Form 1s) with molybdenum results which were quantitated using the proper isotope. The revised data sheets were collated into the data package. A revised IDL summary form and EDD were also submitted.
Verification	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. Acceptable performance is inferred from ongoing acceptable QC sample results.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Cond. (µmhos/cm)	PH (std units)	BOD
LR6-T01N-SFW	949 J	7.8 J	1.4 UJ
LR4-T01N-SFW	387 J	8.1 J	1.4 UJ
LR-4U-T01N-SFW	465 J	8.0 J	1.4 UJ
GARDEN1-T01N-IRW	172 J	8.4 J	1.4 UJ
HUNT2-T01N-SFW	366 J	7.1 J	1.8 J
HUNT1-T01N-SFW	372 J	7.2 J	1.4 J
HUNT1-T01D-SFW	386 J	7.1 J	1.3 UJ
RB01T-SFW	5.0 UJ	6.7 J	1.3 UJ

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Chloride	---	---	---	---	0.25	0.20	RB01T-SFW	U MB-I
Antimony DF=1	0.5	0.5	0.5	0.5	0.453	0.4	GARDEN1-D01N-IRW GARDEN1-T01N-IRW HUNT1-D01D-SFW HUNT1-D01N-SFW HUNT1-T01D-SFW HUNT2-D01N-SFW HUNT2-T01N-SFW LR4-D01N-SFW LR4-T01N-SFW LR-4U-D01N-SFW LR-4U-T01N-SFW LR6-D01N-SFW LR6-T01N-SFW RB01D-SFW	U MB,CCB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum DF=1	69.8	51.7	52.9	58.7	41.420	17.6	GARDEN1-D01N-IRW	U CCB-I
							HUNT1-D01D-SFW HUNT1-D01N-SFW HUNT1-T01D-SFW HUNT1-T01N-SFW HUNT2-D01N-SFW HUNT2-T01N-SFW LR4-D01N-SFW LR-4U-D01N-SFW LR-4U-T01N-SFW LR6-D01N-SFW LR6-T01N-SFW RB01D-SFW RB01T-SFW	U MB,CCB-I
Beryllium DF=1	-0.3	---	---	---	---	0.2	GARDEN1-D01N-IRW GARDEN1-T01N-IRW LR4-D01N-SFW LR4-T01N-SFW LR-4U-D01N-SFW LR-4U-T01N-SFW LR6-D01N-SFW LR6-T01N-SFW	UJ CCB-L
Boron DF=1	---	---	---	---	1.993	1.8	GARDEN1-D01N-IRW GARDEN1-T01N-IRW HUNT1-D01D-SFW HUNT1-D01N-SFW HUNT1-T01D-SFW HUNT1-T01N-SFW HUNT2-D01N-SFW HUNT2-T01N-SFW	U MB-I
Chromium DF=1	---	---	---	-1.0	---	0.8	HUNT1-T01D-SFW HUNT1-D01D-SFW RB01D-SFW	UJ CCB-L
Iron DF=1	---	21.2	26.0	---	---	19.2	GARDEN1-D01N-IRW HUNT1-T01D-SFW HUNT1-T01N-SFW HUNT2-D01N-SFW HUNT2-T01N-SFW LR4-D01N-SFW LR-4U-D01N-SFW LR6-D01N-SFW LR6-T01N-SFW	U CCB-I
Manganese DF=1	---	---	---	---	3.639	1.9	GARDEN1-D01N-IRW HUNT1-D01D-SFW HUNT1-D01N-SFW HUNT1-T01D-SFW HUNT1-T01N-SFW HUNT2-D01N-SFW HUNT2-T01N-SFW	U MB-I

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Molybdenum DF=1	0.6	0.4	0.4	0.4	0.394	0.3	GARDEN1-D01N-IRW	U CCB-I
							RB01D-SFW RB01T-SFW	U MB, CCB-I
Zinc DF=1	---	---	---	---	3.229	1.5	GARDEN1-D01N-IRW LR4-D01N-SFW LR4-T01N-SFW LR-4U-D01N-SFW LR-4U-T01N-SFW LR6-D01N-SFW LR6-T01N-SFW RB01D-SFW	U MB-I

CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Field Duplicate Results Outside Evaluation Criteria and Resultant Data Qualification

Analyte	RL (mg/L)	FD Results		Criteria*	Qualification Code
		HUNT1-T01N-SFW	HUNT1-T01D-SFW		
TSS	0.5	9.1	2.3	13.6 x RL	J FD-I For parent sample and duplicate
Chloride	0.2	4.7	10.9	RPD= 79.5%	J FD-I For parent sample and duplicate
Nitrate	0.2	0.20 U	8.6	33 x RL	J FD-I For parent sample and duplicate

RL = Reporting Limit AD = Absolute Difference

*Criteria: RPD ≤ 30% (when both sample results >5xCRDL), or AD ≤ 2xCRDL (when one or both sample results <5xCRDL)

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: BIO058 Sampling Event: 2004 May South Tailings

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter Date Completed: 06/14/04

Peer Reviewer: Stacey Coker Date Completed: 06/20/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
TSS17-33-T01N-GU	SA	570876	B	X	X
TSS17-33-T02N-GU	SA	570877	B	X	X
TSS17-33-T02D-GU	FD	570878	B	X	X
TSS17-33-T01N-FU	SA	570879	B	X	X
TSS17-33-T02N-FU	SA	570880	B	X	X
TSS17-33-T02D-FU	FD	570881	B	X	X
TSS17-33-T01N-GW	SA	570882	B	X	X
TSS17-33-T02N-GW	SA	570883	B	X	X
TSS17-33-T02D-GW	FD	570884	B	X	X
TSS17-33-T01N-FW	SA	570885	B	X	X
TSS17-33-T02N-FW	SA	570886	B	X	X
TSS17-31-T01N-GU	SA	570887	B	X	X
TSS17-31-T02N-GU	SA	570888	B	X	X
TSS17-31-T01N-SU	SA	570889	B	X	X
TSS17-31-T02N-SU	SA	570890	B	X	X
TSS17-31-T01N-FU	SA	570891	B	X	X
TSS17-31-T02N-FU	SA	570892	B	X	X
TSS17-31-T01N-GW	SA	570893	B	X	X
RSS17-31-T02N-GW	SA	570894	B	X	X
TSS17-31-T01N-SW	SA	570895	B	X	X
EB058	EB	570896	B	X	X

Matrix: B = Biota

QC Type: SA = Sample EB = Equipment Blank

*Modified inorganics list (% Solids only)

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

An equipment blank (EB) was generated by the laboratory from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentrations <5x the method blank were qualified

as nondetect (U). If any analytes were remaining in the EB, sample results were evaluated for concentrations <5x the concentration and qualified as nondetect.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks • EB058	No	Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. Results were qualified as nondetect on the basis of continuing calibration blank (CCB)/method blank, or estimated (UJ) due to a negative CCB detection, as summarized in Table 1.1. After accounting for method blank contamination, potassium and zinc were detected in the equipment blank (EB058) at concentrations of 12.6 and 0.22 mg/kg respectively. All of the potassium and zinc sample results were reported at concentrations in excess of five times the concentration found in the equipment blank, and therefore did not require qualification.
Matrix QC • MS/D TSS17-33-T01N-FUS TSS17-33-T01N-FWS TSS17-31-T01N-FUS • LD TSS17-33-T01N-FUD TSS17-33-T01N-FWD TSS17-31-T01N-FUD • PDS TSS17-33-T01N-FUA TSS17-33-T01N-FWA TSS17-31-T01N-FUA	No	Results for various analytes were outside the 75-125% recovery acceptance range for two of the three matrix spike samples, suggesting potential biases in the reporting of results. Table 1.2 summarizes the analytes recovered outside the acceptance range of 75-125%, along with the qualifications assigned to the parent sample. The matrix quality control results for the May 2004 Biota South Tailings sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment for this event. Post digestion spikes were performed on all metal analytes, with the exception of mercury. The post digestion spike recoveries for those analytes that did not meet the specified criterion for the initial matrix spike recoveries were reviewed. As post digestion spike recoveries for these analytes were recovered within the acceptance range of 75-125%, no qualification on the basis of post digestion spike was necessary for the parent samples. Laboratory duplicate analysis results were reviewed to evaluate the precision of the laboratory analyses. Despite the fact that the laboratory duplicate summary forms reported RPDs in excess of the evaluation criterion for several analytes, no qualification of data was necessary when the CRDL was used in place of the IDL, adjusted for dilution, for the concentration-dependent comparison calculations.
Method QC • Serial Dilution TSS17-33-T01N-FUL TSS17-33-T01N-FWL TSS17-31-T02N-FUL • Internal Standards	No	The serial dilution analyses conducted on the three matrix spike samples listed to the left were not applicable for many of the 24 metal analytes, as between 4-8 analytes in each of the serial dilution samples exhibited initial concentrations in excess of 50 times the IDL. The percent deviations between the original result and its 5-fold dilution were compared to an evaluation criterion of ±10%. Potassium %Ds were in excess of 10% for all three serial dilution tests. As the diluted result is generally considered to be the more accurate of the two, a bias direction of low was assessed for all three samples. Accordingly, potassium results for these three samples were qualified as estimated (J) DL-L. The serial dilution results for the May 2004 Biota South Tailings sampling will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for this event.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate TSS17-33-T02N/D-GU TSS17-33-T02N/D-FU TSS17-33-T02N/D-GW • Rinsate Blank • Field Blank	Yes	Three field duplicate pairs were evaluated using concentration-dependent criteria. All field duplicate pair agreements met the criteria and therefore did not result in qualification. The field duplicate results for the May 2004 Biota South Tailings sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for this event.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS • CRDL	No	Information regarding the mass calibration and resolution are not available due to the software limitations. However, acceptable performance can be inferred from the other QC sample results, which satisfied evaluation criteria. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not necessary. **CRDL -** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum recovery of 161.0% and iron recovery of 160.2%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum CRDL concentrations of 20 mg/kg and iron CRDL concentration of 10 mg/kg. Sample data were not qualified on the basis of CRDL standard recoveries.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Beryllium (P)	---	---	---	---	0.2	---	0.2	TSS17-31-T02N-GW TSS17-33-T01N-GU TSS17-33-T01N-GW	U CCB-I
Boron (P)	2	---	---	---	---	0.468	1.8	EB058 TSS17-31-T02N-GW TSS17-33-T01N-GW TSS17-33-T02D-GW TSS17-33-T02N-GW	U MB-I
Cadmium (P)	---	0.5	---	---	---	---	0.3	TSS17-33-T01N-FU TSS17-33-T01N-FW TSS17-33-T02D-FU TSS17-33-T02D-GU TSS17-33-T02D-GW TSS17-33-T02N-FU TSS17-33-T02N-GU	U CCB-I
Chromium (P)	-0.2	-0.2	-0.2	-0.2	-0.2	---	0.1	EB058 TSS17-31-T01N-FU TSS17-31-T01N-GW TSS17-31-T01N-SU TSS17-31-T01N-SW TSS17-33-T01N-FU TSS17-33-T01N-FW TSS17-33-T01N-GU TSS17-33-T01N-GW TSS17-33-T02N-FW	J CCB-L
Copper (P)	---	2.3	0.9	1.1	---	0.071	0.7	TSS17-33-T01N-FW	U CCB-I
Molybdenum (P)	---	---	---	---	---	0.275	1.0	TSS17-31-T01N-FU TSS17-31-T01N-GU TSS17-31-T01N-GW TSS17-31-T01N-SU TSS17-31-T01N-SW TSS17-31-T02N-FU TSS17-31-T02N-GW TSS17-33-T01N-FU TSS17-33-T01N-FW TSS17-33-T01N-GU TSS17-33-T01N-GW TSS17-33-T02D-FU TSS17-33-T02D-GW TSS17-33-T02N-FU TSS17-33-T02N-FW	U MB-I

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Nickel (P)	-2.4	-2.0	-2.1	-1.9	-2.4	-0.27	1.4	EB058 TSS17-31-T01N-FU TSS17-31-T01N-GU TSS17-31-T01N-GW TSS17-31-T01N-SU TSS17-31-T01N-SW TSS17-31-T02N-FU TSS17-31-T02N-GW TSS17-31-T02N-SU TSS17-33-T01N-FU TSS17-33-T01N-FW TSS17-33-T01N-GU TSS17-33-T01N-GW TSS17-33-T02D-FU TSS17-33-T02D-GW TSS17-33-T02N-FU TSS17-33-T02N-FW TSS17-33-T02N-GW	UJ MB,CCB-L J MB,CCB-L
Sodium (P)	---	---	---	---	---	148.3	172.6	All sample results were qualified	U MB-I

P=ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit EB = Equipment Blank U = Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Qualification Codes
TSS17-33-T10N-FU				
Mercury	46.1	---	75-125%	UJ MS-L
Zinc	155.8	98.5		J MS-H
TSS17-33-T01N-FW				
Arsenic	62.7	85.6	75-125%	UJ MS-L
Mercury	59.1	---		UJ MS-L

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: BIO059 Sampling Event: 2004 May South Tailings

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 06/14/04

Peer Reviewer: Stacey Coker Date Completed: 06/20/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
TSS17-31-T02N-SW	SA	570897	B	X	X
TSS17-31-T01N-FW	SA	570898	B	X	X
TSS17-31-T01D-FW	FD	570899	B	X	X
TSS17-31-T02N-FW	SA	570900	B	X	X
TSS17-41-T01N-GU	SA	570901	B	X	X
TSS17-41-T02N-GU	SA	570902	B	X	X
TSS17-41-T01N-GW	SA	570903	B	X	X
TSS17-41-T02N-GW	SA	570904	B	X	X
TSS17-41-T01N-FU	SA	570905	B	X	X
TSS17-41-T02N-FU	SA	570906	B	X	X
TSS17-41-T01N-FW	SA	570907	B	X	X
TSS17-41-T02N-FW	SA	570908	B	X	X
TSS17-41-T02D-FU	FD	570909	B	X	X
TSS17-39-T01N-GW	SA	570910	B	X	X
TSS17-39-T02N-GW	SA	570911	B	X	X
TSS17-39-T01N-FW	SA	570912	B	X	X
TSS17-39-T02N-FW	SA	570913	B	X	X
TSS17-39-T01D-FW	FD	570914	B	X	X
TSS17-39-T01N-GU	SA	570915	B	X	X
TSS17-39-T02N-GU	SA	570916	B	X	X
EB059	EB	570917	B	X	X

Matrix: B = Biota
QC Type: SA = Sample EB = Equipment Blank
*Modified inorganics list (% Solids only)

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

An equipment blank (EB) was generated by the laboratory from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentrations <5x the method blank were qualified

as nondetect (U). If any analytes were remaining in the EB, sample results were evaluated for concentrations <5x the concentration and qualified as nondetect.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks • EB059	No	Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. Results were qualified as nondetect on the basis of continuing calibration blank (CCB)/method blank (MB), or estimated (J/UJ) due to a negative CCB detection, as summarized in Table 1.1. After accounting for method blank contamination, potassium was detected in the equipment blank (EB059) at a concentration of 18.6 mg/kg. As all of the potassium sample results were reported at concentrations in excess of five times this amount, no qualification was considered necessary.
Matrix QC • MS/D TSS17-31-T02N-FWS • LD TSS17-31-T02N-FWD • PDS TSS17-31-T02N-FWA	No	Mercury was recovered at 58.6% in the matrix spike sample. As there was no post digestion spike prepared for mercury, it was difficult to assess the recovery as a function of analysis. The result for mercury in the parent sample (TSS17-31-T02N-FW) was qualified as estimated (UJ) with a low bias direction assigned. The matrix quality control results for the May 2004 Biota South Tailings sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment for this event. Laboratory duplicate analysis results were reviewed to evaluate the precision of the laboratory analyses. Despite the fact that the laboratory duplicate summary forms reported RPDs in excess of the evaluation criterion for several analytes, no qualification of data was necessary when the CRDL was used in place of the IDL, adjusted for dilution, for the concentration-dependent comparison calculations.
Method QC • Serial Dilution TSS17-31-T02N-FW • Internal Standards	No	The serial dilution analysis conducted on matrix spike sample TSS17-31-T02N-FW was not applicable for 21 of the 24 metal analytes, as only three analytes (calcium, potassium, and zinc) exhibited initial concentrations in excess of 50 times the IDL. The percent deviations between the original result and its 5-fold dilution were compared to an evaluation criterion of ±10% for these three analytes. Potassium and zinc both reported %Ds in excess of 10%;at 20.6% and 13.5%, respectively. Accordingly, potassium and zinc results in this parent sample were qualified as estimated (J) with a low bias direction assigned. The serial dilution results for the May 2004 Biota South Tailings sampling will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for this event.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Field QC • Field Duplicate TSS17-31-T01N/D-FW TSS17-41-T02N/D-FU TSS17-39-T01N/D-FW • Rinsate Blank • Field Blank	No	Three field duplicate pairs were evaluated using concentration-dependent criteria. Both iron results for samples TSS17-31-T02N-FU and TSS17-31-T02D-FU were qualified as estimated (J) on the basis of field duplicate disagreement. As both results (913 and 460 mg/kg, respectively) were less than 5x the CRDL (100 mg/kg), the difference between the two values was compared to an evaluative criteria of <4x CRDL. All remaining field duplicate pair agreements met the criteria set forth in 12.1 and therefore did not result in qualification. The field duplicate results for the May 2004 Biota South Tailings sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for this event.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: **Metals:** Interference Check Sample Results **–** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not necessary. **Metals: Contract Required Detection Limit –** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P)	18.6	---	---	---	---	17.6	TSS17-31-T01D-FW TSS17-31-T01N-FW	U CCB-I
Boron (P)	---	---	---	---	0.57	1.8	EB059 TSS17-39-T01N-GW TSS17-39-T02N-GU TSS17-39-T02N-GW TSS17-41-T01N-GU TSS17-41-T01N-GW TSS17-41-T02N-GW	U MB-I

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Chromium (P)	-0.2	-0.2	-0.2	-0.2	---	0.10	EB059 TSS17-31-T01D-FW TSS17-31-T01N-FW TSS17-31-T02N-FW TSS17-31-T02N-SW TSS17-39-T01D-FW TSS17-39-T01N-FW TSS17-39-T01N-GU TSS17-39-T01N-GW TSS17-39-T02N-FW TSS17-39-T02N-GW TSS17-41-T01N-FU TSS17-41-T01N-FW TSS17-41-T01N-GU TSS17-41-T01N-GW TSS17-41-T02D-FU TSS17-41-T02N-FW TSS17-41-T02N-GW	UJ CCB-L J CCB-L
Sodium (P)	-228.1	---	-350.8	---	60.5	172.6	EB059 TSS17-31-T01D-FW TSS17-31-T01N-FW TSS17-31-T02N-SW TSS17-39-T01D-FW TSS17-39-T01N-FW TSS17-39-T01N-GU TSS17-39-T01N-GW TSS17-39-T02N-FW TSS17-39-T02N-GU TSS17-39-T02N-GW TSS17-41-T01N-FW TSS17-41-T01N-GU TSS17-41-T01N-GW TSS17-41-T02D-FU	UJ MB,CCB-L U MB-I

P=ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit EB = Equipment Blank U = Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: BIO060 Sampling Event: 2004 May South Tailings

Matrix: Solid ☐ Water ☐ Biota ☒

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Karen Kronoveter Date Completed: 06/14/04

Peer Reviewer: Stacey Coker Date Completed: 06/20/04

The table below summarizes the results presented in this data package.

Field ID	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics*
TSS17-39-T01N-FU	SA	570918	B	X	X
TSS17-39-T02N-FU	SA	570919	B	X	X
TSS17-37-T01N-GU	SA	570920	B	X	X
TSS17-37-T02N-GU	SA	570921	B	X	X
TSS17-37-T01N-GW	SA	570922	B	X	X
TSS17-37-T02N-GW	SA	570923	B	X	X
TSS17-37-T02D-GW	FD	570924	B	X	X
TSS17-37-T01N-FU	SA	570925	B	X	X
TSS17-37-T02N-FU	SA	570926	B	X	X
TSS17-37-T01N-FW	SA	570927	B	X	X
TSS17-37-T02N-FW	SA	570928	B	X	X
TSS17-35-T01N-GU	SA	570929	B	X	X
TSS17-35-T02N-GU	SA	570930	B	X	X
TSS17-35-T01N-FU	SA	570931	B	X	X
TSS17-35-T02N-FU	SA	570932	B	X	X
TSS17-35-T01N-GW	SA	570933	B	X	X
TSS17-35-T02N-GW	SA	570934	B	X	X
TSS17-35-T01N-FW	SA	570935	B	X	X
TSS17-35-T02N-FW	SA	570936	B	X	X
EB060	EB	570937	B	X	X

Matrix: B = Biota
QC Type: SA = Sample EB = Equipment Blank
*Modified inorganics list (% Solids only)

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

An equipment blank (EB) was generated by the laboratory from the equipment used for homogenizing the tissue samples. Analytes present in the EB sample at concentrations <5x the method blank were qualified

as nondetect (U). If any analytes were remaining in the EB, sample results were evaluated for concentrations <5x the concentration and qualified as nondetect.

All sample results were reported on a "wet weight" basis (uncorrected for moisture content), despite the fact that the CLP Forms report %Solids = 100% and that results are dry weight. Percent solids analyses were performed and reported separately so that sample results can be converted to "dry weight" basis results if desired.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Laboratory Blanks • Method Blanks • Equipment Blanks EB060	No	Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. Results were qualified as nondetect on the basis of continuing calibration blank (CCB)/method blank (MB), or estimated (J/UJ) due to a negative CCB detection, as summarized in Table 1.1. After accounting for method blank contamination, no analytes were recovered in the equipment blank (EB60). It was therefore not necessary to qualify any data results on the basis of equipment blank contamination.
Matrix QC • MS/D • LD • PDS	N/A	This package did not include any site-specific matrix quality control samples. The matrix quality control results for the May 2004 Biota South Tailings sampling event will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment for this event.
Method QC • Serial Dilution TSS17-39-T01N-FUL • Internal Standards	No	The serial dilution analysis conducted on sample TSS17-39-T01N-FU was not applicable for 18 of the 24 metal analytes, as only six analytes exhibited initial concentrations in excess of 50 times the IDL. The percent deviations between the original result and its 5-fold dilution were compared to an evaluation criterion of ±10% for these six analytes. Only potassium reported a %D in excess of 10%; 18.6%. Accordingly, the potassium result in this parent sample was qualified as estimated (J) with a low bias direction assigned. The serial dilution results for the May 2004 Biota South Tailings sampling will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for this event.
Field QC • Field Duplicate TSS17-37-T02N/D-GW • Rinsate Blank • Field Blank	No	One field duplicate pair was evaluated using the concentration-dependent criteria set forth in SOP 12.1. Both iron and manganese results were qualified in both samples on the basis of field duplicate disagreement, as summarized in Table 1.2. The field duplicate results for the May 2004 Biota South Tailings sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for this event.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: **Metals:** Interference Check Sample Results – Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, no samples reported concentrations of interferent elements approaching the concentrations present in the ICS A and ICS AB. Therefore, data qualification was not necessary. **Metals: Contract Required Detection Limit –** The CRDL standard data was included in the analytical data packages, although not required. These

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "N/A."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum recovery of 166.7% and iron recovery of 168.0%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum CRDL concentrations of 20 mg/kg and iron CRDL concentration of 10 mg/kg. Sample data have not been qualified on the basis of CRDL standard recoveries.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Aluminum (P)	29.2	22.5	27	17.9	4.728	17.6	TSS17-35-T01N-FW TSS17-35-T01N-GW TSS17-37-T01N-GW	U MB,CCB-I U MB-I
Boron (P)	---	---	---	---	0.771	1.8	TSS17-35-T02N-GW TSS17-37-T01N-FW TSS17-37-T01N-GW TSS17-37-T02D-GW TSS17-37-T02N-GU TSS17-37-T02N-GW	U MB-I
Chromium (P)	-0.1	-0.1	-0.1	-0.1	---	0.10	EB060 TSS17-35-T01N-FU TSS17-35-T01N-FW TSS17-35-T01N-GW TSS17-35-T02N-FW TSS17-35-T02N-GW TSS17-37-T01N-FW TSS17-37-T01N-GU TSS17-37-T02N-GW TSS17-39-T01N-FU	UJ CCB-L J CCB-L
Iron (P)	---	---	---	19.3	3.545	19.2	EB060	U MB,CCB-I
Lead (P)	---	---	---	---	0.279	1.7	EB060 TSS17-35-T01N-FU TSS17-35-T01N-GU TSS17-35-T02N-FW TSS17-37-T01N-FW TSS17-37-T01N-GU TSS17-37-T01N-GW TSS17-37-T02D-GW TSS17-37-T02N-FW TSS17-37-T02N-GW TSS17-39-T01N-FU	U MB-I

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Mercury (CV)	---	-0.1	---	---	---	0.10	TSS17-35-T01N-FU TSS17-35-T01N-FW TSS17-35-T01N-GU TSS17-35-T01N-GW TSS17-35-T02N-FU TSS17-35-T02N-GU TSS17-37-T01N-FU TSS17-37-T01N-FW TSS17-37-T01N-GU TSS17-37-T01N-GW TSS17-37-T02D-GW TSS17-37-T02N-FU TSS17-37-T02N-FW TSS17-37-T02N-GU TSS17-37-T02N-GW TSS17-39-T01N-FU TSS17-39-T02N-FU	UJ CCB-L
Molybdenum (P)	---	---	---	---	0.117	1.0	TSS17-39-T01N-FU	U MB-I
Potassium (P)	---	320.9	393.3	428.1	31.84	109.3	EB060	U MB,CCB-I
Sodium (P)	---	---	---	---	89.94	172.6	EB060 TSS17-35-T01N-GU TSS17-35-T01N-GW TSS17-37-T01N-GW TSS17-37-T02N-GU TSS17-39-T01N-FU TSS17-39-T02N-FU	U MB-I

P=ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit EB = Equipment Blank U = Nondetect

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.4a
Field Duplicate Assessment Resulting in Qualification

Samples	Analyte	T02N (mg/kg)	T02D (mg/kg)	CRDL (mg/kg)	Criteria	Action
TSS17-37-T02N/T02D-GW	Iron	853	1450	100	51.8% RPD	J FD-I
	Manganese	205	445	15	73.4 % RPD	

RPD Criteria ≤50% when both sample results are >5xCRDL

Absolute difference < 4xCRDL when either sample result is < 5x CRDL

RPD = Relative Percent Difference

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: SOL102 Sampling Event: South Tailings Investigation

Matrix: Solid ☒ Water ☐ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? Yes

Data Reviewer: Karen Kronoveter Date Completed: 06/17/04

Peer Reviewer: Stacey Coker Date Completed: 06/30/04

The table below summarizes the results presented in this data package.

Field ID(1)	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics
TSS17-39-T01N-SOL	SA	570380	S	X	X
TSS17-40-T01N-SOL	SA	570381	S	X	X
TSS17-32-T01N-SOL	SA	570382	S	X	X
TSS17-35-T01N-SOL	SA	570383	S	X	X
TSS17-41-T01N-SOL	SA	570384	S	X	X
TSS17-33-T01N-SOL	SA	570385	S	X	X
TSS17-33-T01D-SOL	FD	570386	S	X	X
TSS17-34-T01N-SOL	SA	570437	S	X	X
TSS17-37-T01N-SOL	SA	570438	S	X	X
TSS17-36-T01N-SOL	SA	570439	S	X	X
TSS17-38-T01N-SOL	SA	570440	S	X	X
TSS17-31-T01N-SOL	SA	570441	S	X	X

Matrix: S = Solid
QC Type: SA = Sample FD = Field Sample

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary: All issues noted in the case narrative, potentially affecting data quality, are covered in the data review summary table below.

The laboratory case narrative noted that due to the nature of the sample matrix, all of the samples in the delivery group, with exception of TSS17-33-T01N-SOL and TSS17-31-T01N-SOL, were air-dried and sieved at the laboratory prior to analysis (as per URS request). It is noted that the percent solids values reported for these samples were determined after the sieving process was completed.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Nitrate as N. This analyte has a specified holding time in the QAPP of 48 hours for soil and sediment samples. The samples were held at 4°C from their time of collection to the time of sample preparation and analysis. According to internal COC records, all samples were removed from storage on 05/20/04 at 9:10 for preparation and returned the same day. The samples were analyzed several hours beyond 48 hours of the generation of the leachate. As such, all sample results for nitrate were qualified as estimated (UJ) with an indeterminate bias for exceedance of the holding time limit. Since the nitrate is likely to be quite stable at 4°C, it was the judgment of the reviewer that nondetect results did not require rejection for the samples being analyzed after more than 2X the holding time limit. The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken between 20 days after sampling and 18 days beyond log-in. The pH for all samples was measured 9 days beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time had an indeterminate direction of bias.
Method Blanks	No	TOC was detected in the method blanks associated with analysis runs of 05/21/04 and 05/24/04 at 338 and 291 mg/kg, respectively. Due to the fact that all sample results for TOC were sufficiently greater (>5x) than the blank detections, no qualification of detected results as nondetect was necessary. Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. However, several results were qualified on the basis of blank detections, as summarized in Table 1.2.
Matrix QC • MS/D TSS17-33-T01N-SOLMS • LD TSS17-33-T01N-SOLD • PDS TSS17-33-T01N-SOLA	No	Multiple analytes were recovered outside the acceptance range of 75-125% for the inorganics and metals matrix spike analysis of sample TSS17-33-T01N-SOL. It is suspected that a spiking error occurred, as all of the applicable ICP analyzed samples were reported with low recoveries. Nonetheless, parent sample results for these analytes were qualified as estimated. (Table 1.3 summarizes these analytes, along with their recoveries and qualifications to the parent samples. Post digestion spikes were performed on all metal analytes. The post digestion spike recoveries for those analytes that did not meet the specified criterion for the initial matrix spike recoveries were reviewed. Zinc was recovered below the acceptance range in the parent sample, suggesting a potential low bias. Qualification on the basis of post digestion spike recovery was issued for the parent sample in addition to matrix spike recovery, as summarized in Table 1.3. Laboratory duplicate analysis results were reviewed and determined to fall within the criteria set for in the SOP 12.1. No qualification of data results was necessary on the to evaluate the precision of the laboratory analyses. Despite the fact that the laboratory duplicate summary forms reported RPDs in excess of the evaluation criterion for several analytes, no qualification of data was necessary when the CRDL was used in place of the IDL, adjusted for dilution, for the concentration-dependent comparison calculations.

Review Parameter	Criteria Met?	Comments
		The matrix quality control results for the 2004 South Tailings sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment for soil samples.
Method QC • Serial Dilution TSS17-33-T01N-SOL • Internal Standards	No	The serial dilution analysis conducted on sample TSS17-33-T01N-SOL was not applicable for 10 of the 24 metal analytes, as 14 of the analytes exhibited initial concentrations in excess of 50 times the IDL. The percent deviation between the original result and its 5-fold dilution was compared to an evaluation criterion of ±10%. Table 1.4 summarizes the serial dilution results outside the evaluation criterion of ±10% and the resultant data qualification issued. The internal standard recovery of ^{89}Y was high for the ICPMS analysis of sample TSS17-39-T01N-SOL. Accordingly, the molybdenum result for this sample, as verified by the run-logs, was reported from the trace ICP. The trace ICP reporting limits met the requirement of the QAPP such that the change in instrumentation did not affect the usability of the data. The serial dilution results for the 2004 South Tailings sampling event will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for soil samples.
Field QC • Field Duplicate TSS17-33-T01N/D-SOL • Rinsate Blank • Field Blank	Yes	One field duplicate pair was assessed for field duplicate agreement and met the concentration-dependent criteria set forth in SOP 12.1. It was therefore unnecessary to qualify any sample results on the basis of field duplicate disagreement. The field duplicate results for the 2004 South Tailings sampling event will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for soil samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	NA	
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS • CRDL	Yes	Information regarding the mass calibration and resolution are not available due to the software limitations. However, acceptable performance can be inferred from the other QC sample results, which satisfied evaluation criteria. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. Accordingly, several sample results were qualified on the basis of biases suggested by the ICS A analyses. Table 1.5 summarizes the analytes and samples for which qualification was necessary. **CRDL -** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the

Review Parameter	Criteria Met?	Comments
		data validation process. All recoveries were within the 50-150% criteria, with the exception of the aluminum recovery of 153.2%. Associated aluminum sample results may potentially be biased high for values reported close to the aluminum CRDL concentrations of 20 mg/kg. Sample data were not qualified on the basis of CRDL standard recoveries.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Nitrate –N (mg/L)	Cond. (µmhos/cm)	PH (std units)
TSS17-39-T01N-SOL	2.6 J	148 J	7.3 J
TSS17-40-T01N-SOL	5.2 J	194 J	8.1 J
TSS17-32-T01N-SOL	2.5 J	703 J	7.7 J
TSS17-35-T01N-SOL	4.0 J	402 J	8.3 J
TSS17-41-T01N-SOL	2.2 UJ	310 J	7.4 J
TSS17-33-T01N-SOL	71.6 J	682 J	7.4 J
TSS17-33-T01D-SOL	66.7 J	658 J	7.4 J
TSS17-34-T01N-SOL	13.2 J	5220 J	8.1 J
TSS17-37-T01N-SOL	2.6 J	7370 J	7.6 J
TSS17-36-T01N-SOL	3.0 J	2060 J	7.6 J
TSS17-38-T01N-SOL	2.25 J	1420 J	8.3 J
TSS17-31-T01N-SOL	144 J	3680 J	8.3 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (MS)							All sample results were qualified	U MB,CCB-I
Boron (P)							TSS17-32-T01N-SOL TSS17-35-T01N-SOL TSS17-36-T01N-SOL TSS17-39-T01N-SOL TSS17-41-T01N-SOL	UJ CCB-L
Silver (P)							TSS17-32-T01N-SOL TSS17-35-T01N-SOL TSS17-38-T01N-SOL TSS17-39-T01N-SOL TSS17-40-T01N-SOL	U CCB-I
Sodium (P)							All sample results were qualified	J CCB-L UJ CCB-L

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Qualification Codes
TSS17-33-T01N-SOL				
TOC	73	NA	75-125%	J MS-L
Antimony	10.9	86.6		
Arsenic	55.6	86.5		
Barium	57.2	91.0		
Beryllium	70.6	101.8		
Boron	62.1	97.7		
Cadmium	67.7	94.1		
Chromium	51.0	88.4		
Cobalt	66.1	93.2		
Copper	58.9	97.4		
Molybdenum	63.8	95.9		
Nickel	62.9	91.3		
Silver	69.8	92.3		UJ MS-L
Vanadium	63.5	95.7		J MS-L
Zinc	-17.8*	35.0		J MS,PDS-L

*If the laboratory duplicate result is used in the matrix spike recovery calculation, a matrix spike recovery of 47% is attained.

Table 1.4
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	%D	Qualification Codes
TSS17-33-T01N-SOL		
Potassium	26.2	J DL-L
Zinc	13.9	

Table 1.5
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Boron	-36	1.8	TSS17-32-T01N-SOL TSS17-37-T01N-SOL	J/UJ ICS-L
Cadmium	3.0	0.3		J ICS-H
Silver	2.0	1.0		NQ (ND)*

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

NQ (ND)* = No qualification necessary when a potential high bias is associated with a nondetect result.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: SOL101 Sampling Event: MMW-50A Installation (March 2004)

Matrix: Soil ☒ Water ☐ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike Date Completed: 06/17/04

Peer Reviewer: Stacey Coker Date Completed: 06/20/04

The table below summarizes the results presented in this data package.

SUMMARY OF SAMPLES WITH ANALYSES

Field ID[1]	QC Type	Lab ID	CLP Form Field ID Abbreviation[2]	Matrix	Analyses	
					Metals	Inorganics
MMW-50A-T01N-SOL	SA	562780		S	X	X
MMW-50A-T02N-SOL	SA	562101		S	X	X
MMW-50A-T03N-SOL	SA	562102		S	X	X

Matrix: S = Soil
QC Type: SA = Sample
[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues noted in the case narrative that potentially affect data quality are addressed in the data review table below.

During the metals data review process, the laboratory observed differences between the results obtained from the ICP/MS and the Trace ICP for several elements for samples in this SDG. The samples were gravelly in nature, indicating the possibility that the difference in results was due to non-homogeneity of the samples.

For sample MMW-50A-T01N-SOL, the majority of analyte results from the ICP were between 2 and 10 times different than the ICPMS results. Therefore, as a conservative measure, all metal analyte results for sample MMW-50A-T01N-SOL were qualified as estimated (**J/UJ TvP-I**).

For samples MMW-50A-T02N-SOL and MMW-50A-T03N-SOL only some metal analytes had a greater than 2 fold difference between the ICP and ICPMS results. As a conservative measure, results for the affected metals were qualified as estimated. For sample MMW-50A-T02N-SOL, boron, lead, molybdenum, silver, sodium and thallium results were qualified as estimated (**J/UJ TvP-I**). For sample MMW-50A-T03N-SOL, barium, magnesium, sodium, vanadium, and zinc results were qualified as estimated (**J/UJ TvP-I**).

Review Parameter	Criteria Met?	Comments
Sample-specific ***Parameters***	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	Per the client's request, the sample ID received as MMW-50A-45-50 was changed to MMW-50A-T02N-SOL and MMW-50A-50-53 was changed to MMW-50A-T03N-SOL. In addition, limited inorganic analyses (i.e., sulfate, fluoride, TOC and paste pH) were added to these two soil samples. For sample MMW-50A-T01N-SOL, the sample manager inadvertently checked the box for dissolved metals analyses rather than inogranics, but based on the notes specifying which inorganic parameters were needed, the laboratory logged the sample analyses in correctly.
Holding Times	No	All samples in this SDG were analyzed 6-14 days outside of holding time for pH. Table 1.1 summarizes the holding time exceedances and the resultant data qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.2 summarizes the metals blank detections and the resultant data qualifications.
Matrix QC MS LD	N/A	This package did not include any site-specific matrix quality control samples.
Method QC Serial Dilution MMW-50A-T01N-SOL	Yes	The serial dilution analysis run on sample MMW-50A-T01N-SOL was applicable for only six of the 24 analytes. As the %Ds for the applicable analytes ranged between 0.3% and 2.6%, no qualification of data results was necessary.
Field QC Field Duplicate Rinsate Blank Field Blank Trip Blank	N/A	This package did not include any site-specific field quality control samples.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	In the initial set of results, the sulfate and fluoride results for sample MMW-50A-T01N-SOL were reported in aqueous units. The laboratory was contacted and a revised data sheet and EDD were provided. The revised data was collated into the data package and database. Later, during quality check on the database, it was noted that the metal results for sample MMW-50A-T01N-SOL had units of mg/kg rather than mg/kg-dry. The hardcopy results were checked back to the raw data and it was determined that the reported results were indeed dry weight results. The laboratory confirmed that the values were correct, but the units in the EDD were incorrect. A revised EDD in which the units for this sample were corrected to mg/kg-dry was provided.
Other parameters evaluated on the basis of case narrative comments or review of laboratory performance parameters.	No	**ICS-** All samples contained concentrations of one or more interfering elements (Al, Ca, Mg, and Fe) equal to or greater than those in the interference check samples (ICSs). As such it was necessary to evaluate any positive or negative biases in sample results suggested by the results for the ICS A analyses (ICS A only contains interfering elements). B, Cd, Cr, Sb, Se, V, and Zn were reported as present in ICS A at concentrations for which the absolute value was > IDL. The antimony result for sample MMW-50A-T02N-SOL was qualified as estimated (**UJ ICS-H**).

Table 1.1

Samples and Results Qualified by Holding Time Exceedance

Analysis	Samples qualified	QAPP Requirement	Time Beyond Holding Time Limit	Qualification (1)
pH	All pH results in this SDG	Immediately upon receipt	6-14 days	J HT-I

All samples will be given an indeterminate (I) bias code for hold time qualification.

Table 1.2

Metals Blanks Detections and Qualifications

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification and Qualification Codes
Antimony DF=10	0.4	0.4	---	0.359	0.2	MMW-50A-T01N-SOL MMW-50A-T03N-SOL	U CCB,MB-I
						MMW-50A-T02N-SOL	U CCB-I
Arsenic DF=10	0.1	---	----	---	0.1	MMW-50A-T03N-SOL	U CCB-I
Boron DF=1	2.6	2.8	---	0.457	2.3	MMW-50A-T01N-SOL	U MB-I
						MMW-50A-T03N-SOL	U CCB,MB-I
Chromium DF=1	---	---	1.8	0.224	1.5	MMW-50A-T03N-SOL	U CCB,MB-I
Silver DF=1	2.5	---	2.5	---	2.1	MMW-50A-T02N-SOL MMW-50A-T03N-SOL	U CCB-I
Sodium DF=1	---	---	---	64.9	514.9	MMW-50A-T01N-SOL MMW-50A-T03N-SOL	U MB-I
Selenium DF=10	0.4	---	---	---	0.2	MMW-50A-T01N-SOL MMW-50A-T02N-SOL MMW-50A-T03N-SOL	U CCB-I

CCB – Continuing Calibration Blank **MB –** Method of Preparation Blank **IDL –** Instrument Detection Limit for Metals

Note: Table was limited to blank result that indicated data qualification. As such, all blank detections may not be shown.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: L44850 Sampling Event: MMW-50A Installation

Matrix: Soil ☒ Water ☐ Biota ☐

Sample-specific Parameter Review? Yes Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike Date Completed: 07/01/04

Peer Reviewer: Stacey Coker Date Completed: 07/01/04

The table below summarizes the results presented in this data package.

SUMMARY OF SAMPLES WITH ANALYSES

Field ID(1)	QC Type	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses		
					Metals [1, 3]	SPLP Metals [2]	ABA[3]
MMW-50A-T01N-SOL	SA	LL44850-02		S	X		X
MMW-50A-T01N-SOL3:1	SA	LL44850-02		L		X	
MMW-50A-T01N-SOL20:1	SA	LL44850-03		L		X	
MMW-50A-T02N-SOL	SA	LL44850-04		S	X		X
MMW-50A-T02N-SOL3:1	SA	LL44850-04		L		X	
MMW-50A-T02N-SOL20:1	SA	LL44850-05		L		X	
MMW-50A-T03N-SOL	SA	LL44850-06		S	X		X
MMW-50A-T03N-SOL3:1	SA	LL44850-06		L		X	
MMW-50A-T03N-SOL20:1	SA, MS, MSD	LL44850-07		L		X	

Matrix: S = Soil L= Leachate

Analysis: ABA= Acid Base Accounting SPLP= Synthetic Precipitation Leaching Procedure

QC Type: SA = Sample MS= Matrix Spike MSD= Matrix Spike Duplicate

[1] Molybdenum only; sample aliquot was biased toward high molybdenum content.

[2] Two leachate solutions were generated; one was at a 3 to 1 leachate to solid ratio and the other was at a 20 to 1 leachate to solid ratio as denoted by the suffixes appended by the laboratory.

[3] The laboratory reported the results for the soil samples under the 3:1 leachate sample ID.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues noted in the case narrative that potentially affect data quality are addressed in the data review table below.

Review Parameter	Criteria Met?	Comments
Sample-specific ***Parameters***	Complete with "Yes", "No", or "Not Applicable".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The laboratory inadvertently reported the results for the soil samples with a "3:1" suffix which was use to denote results for the 3:1 leachate sample.
Holding Times	No	All samples in this SDG were analyzed within holding time. No qualifications of data were necessary.
Method Blanks	No	Various metals were detected in the metal preparation blanks. Table 1.1 summarizes the metals blank detections and the resultant data qualifications.
Matrix QC MS MMW-50A-T03N-SOL20:1 LD MMW-50A-T02N-SOL20:1 MMW-50A-T03N-SOL3:1	No	For the matrix spike on sample MMW-50A-T03N-SOL20:1, the recoveries for calcium, magnesium, potassium, and sodium outside evaluation criteria. Table 1.2 summarizes the outlying matrix spike recoveries and the resultant data qualifications. Matrix QC results for non-site related samples were disregarded.
Method QC Serial Dilution MMW-50A-T03N-SOL20:1 Total vs Partial	Yes	The serial dilution analysis run on sample MMW-50A-T03N-SOL20:1 was not applicable for any of the 24 analytes. The analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. No qualification of data results was necessary. For all samples, the sum of the sulfur form results, and residual sulfur results equaled the total sulfur result. Therefore, no qualifications of data were necessary.
Field QC Field Duplicate Rinsate Blank Field Blank Trip Blank	N/A	This package did not include any site-specific field quality control samples.
Nondetect Results w/ Elevated RLs?	No	
Package Completeness	No	The results are usable for the project objective of determining analyte concentrations in soil except for the calcium, potassium and sodium results for sample MMW-50A-T01N-SOL20:1 which were rejected due to low matrix spike recoveries. The completeness for the data set is 98.33%.
Other parameters evaluated on the basis of case narrative comments or review of laboratory performance parameters.	No	Positive results between the method detection limit (MDL) and practical quantitation limit (PQL) were qualified as estimated (J SQL-I) to reflect the greater uncertainty with quantitative results below the PQL.

Table 1.1

Metals Blanks Detections and Qualifications

Analyte	MB (mg/L)	MDL (µg/l)	Samples Qualified	Qualification and Qualification Codes
Arsenic DF=10	0.00519	0.003	MMW-50A-T01N-SOL3:1 MMW-50A-T01N-SOL20:1 MMW-50A-T02N-SOL3:1 MMW-50A-T02N-SOL20:1 MMW-50A-T03N-SOL3:1 MMW-50A-T03N-SOL20:1	U MB-I
Cadmium DF=10	0.00072	0.0005	MMW-50A-T01N-SOL20:1 MMW-50A-T02N-S0L3:1 MMW-50A-T02N-SOL20:1 MMW-50A-T03N-SOL3:1 MMW-50A-T03N-SOL20:1	U MB-I
Iron DF=1	0.016	0.05	MMW-50A-T03N-SOL3:1 MMW-50A-T03N-SOL20:1	U MB-I
Lead DF=1	0.0025	1.5	MMW-50A-T01N-SOL3:1 MMW-50A-T01N-SOL20:1 MMW-50A-T02N-SOL3:1 MMW-50A-T02N-SOL20:1 MMW-50A-T03N-SOL3:1 MMW-50A-T03N-SOL20:1	U MB-I

MB – Method of Preparation Blank **IDL –** Instrument Detection Limit for Metals

Note: Table was limited to blank result that indicated data qualification. As such, all blank detections may not be shown.

Table 1.2

Matrix Spike Recovery Results for Sample MMW-50A-T03N-SOL20:1

Analyte	MS%R or MS and MSD %R's	Comment	Action[1]
Calcium	19.0/ 19.1	Average percent recoveries less than 30.0%	Qualify parent sample R MS-L
Magnesium	33.3/ 33.8	Nondetect result for parent sample	Qualify parent sample UJ MS-L
Potassium	17/ 17.4	Average percent recoveries less than 30.0%	Qualify parent sample R MS-L
Sodium	17/ 17.5	Average percent recoveries less than 30.0%	Qualify parent sample R MS-L

Evaluation criteria MS % R 75 – 125 %

[1] Qualification was limited to the parent sample because the "T01N, "T02N" and "T03N" samples were collected from different depth intervals which had distinctly different geology and were therefore considered to be distinctly separate matrices.

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE SEPTEMBER 2004 SERIAL DILUTION STUDY,

A COMPONENT OF THE SUPPLEMENTAL SPRING 13 AND SPRING 39 SAMPLING EVENT

Prepared for

Molycorp, Inc.
Questa, New Mexico

December 2004

URS

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Dilution Schemes/Non-Detects With Elevated RLs 3-1
3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 3-1
3.2.3 Non-Valid Matrix Spikes 3-2
3.2.4 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Summary/Assessment of Matrix QC 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.1.1 Serial Dilution Matrix Spike Results 4-2
4.1.2 Mixing Water Matrix Spike Results 4-3
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-4
4.3 Serial Dilution Results 4-5
4.3.1 Serial Dilution Water Serial Dilution Results 4-5
4.3.2 Mixing Water Serial Dilution Results 4-7

Section 5 Collective Summary/Assessment of Field QC Samples 5-1

5.1 Field Duplicate Results 5-1
5.2 Rinsate Blank Results 5-2
5.3 Field Blank Results 5-2

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-1
6.4 Representativeness 6-1
6.5 Comparability 6-2
6.6 Sensitivity 6-2

TABLE OF CONTENTS

List of Tables

Table 1-1 Summary of Serial Dilution Study Water Samples Collected in September 2004

Table 1-2 Summary of Mixing Water Samples Collected in September 2004

Table 4-1 Field Samples Designated for Matrix QC Analysis

Table 4-2 Inorganics Matrix Spike Results for Serial Dilution Water

Table 4-3 Inorganics Matrix Spike Results for Mixing Water

Table 4-4 Inorganics Laboratory Duplicate Results

Table 4-5 ICP Serial Dilution Samples

Table 4-6 ICP Serial Dilution Results for Serial Dilution Water

Table 4-7 ICP Serial Dilution Results for Mixing Water

Table 5-1 Summary of Field Duplicate Serial Dilution Study Samples Collected

Table 5-2 Summary of Field Duplicate Serial Dilution Study Sample Exceedances

List of Attachments

Attachment 1.1 Data Review Summary Report for Data Package WAT 301

Attachment 1.2 Data Review Summary Report for Data Package WAT 303

Attachment 1.3 Data Review Summary Report for Data Package WAT 307

Attachment 1.4 Data Review Summary Report for Data Package WAT 310

Attachment 1.5 Data Review Summary Report for Data Package WAT 314

This Data Validation Report (DVR) contains the results of the data validation conducted for 12 serial dilution samples and 22 mixing water samples, and associated quality control (QC) samples collected during the September 2004 Serial Dilution Study. The Serial Dilution Study was one component of the Supplemental Spring 13 and 39 Sampling Event conducted as part of the Molycorp RI/FS. The following two matrices were sampled for the Serial Dilution Study:

- Serial Dilution Water
- Mixing Water

The serial dilution water samples were collected from four locations on three different days. The locations sampled included Spring 13 Pump, Spring 39 Pump, the Red River Upstream of Spring 13 Pump and the Red River Upstream of Spring 39 Pump. The mixing water samples were comprised of various dilution combinations of Spring 13 Pump water with Upstream of Spring 13 Pump water and Spring 39 Pump water with Upstream of Spring 39 Pump water. Biological test organisms (i.e., fish) were placed in containers of the various dilution mixes. The mixing water samples were collected on three different days just prior to the addition of renewal water to each mixture. The bioassay component of the study was conducted in the laboratory at Chadwick Ecological Consultants.

The serial dilution water and mixing water samples for chemical analysis were sent to STL Burlington (STL-B), in Colchester, Vermont for metals and inorganic parameters analysis. The results for the serial dilution study were reported in five data packages WAT301, WAT310, WAT303, WAT307, and WAT314. The results for the serial dilution water were reported in data packages WAT301 and WAT310. The results for the mixing water were reported in data packages WAT303, WAT307, and WAT314.

- The serial dilution samples were analyzed for total metals, dissolved metals and inorganic parameters; and
- The mixing water samples were analyzed for total metals (aluminum and iron only), dissolved metals and inorganic parameters (fluoride, chloride, conductivity, TDS, pH, sulfate, TOC, and hardness only).

This data validation report describes the data validation process used and presents the data review results for the field and associated QC samples submitted to STL for chemical analysis. The field sample IDs and associated data package numbers for the serial dilution water samples are provided in Table 1-1. The field sample IDs and associated data package numbers for the mixing water samples are provided in Table 1-2.

Table 1-1
Summary of Serial Dilution Study Water Samples Collected in September 2004

Sample Identification	Total Metals	Dissolved Metals	Inorganics
WAT301			
SPRING13PUMP-T01N-GRW	X		X
SPRING13PUMP-D01N-GRW		X	X (DOC only)
SPRING13PUMP-T01D-GRW	X, FD		X, FD
SPRING13PUMP-D01D-GRW		X, FD	X, FD (DOC only)
SPRING39PUMP-T01N-GRW	X		X
SPRING39PUMP-D01N-GRW		X	X (DOC only)
RRUSSPRING13-T01N-SFW	X		X
RRUSSPRING13-D01N-SFW		X	X (DOC only)
RRUSSPRING39-T01N-SFW	X		X
RRUSSPRING39-D01N-SFW		X	X (DOC only)
SPRING13PUMP-T03N-SFW	X		X
SPRING13PUMP-D03N-SFW		X	X (DOC only)
SPRING39PUMP-T03N-SFW	X		X
SPRING39PUMP-D03N-SFW		X	X (DOC only)
RRUSSPRING39-T03N-SFW	X		X
RRUSSPRING39-D03N-SFW		X	X (DOC only)
RRUSSPRING13-T03N-SFW	X, MS, LD, SD, PDS		X, MS, LD
RRUSSPRING13-D03N-SFW		X, MS, LD, SD, PDS	X, MS, LD (DOC only)
WAT310			
SPRING13PUMP-T05N-GRW	X		X
SPRING13PUMP-D05N-GRW		X	X (DOC only)
SPRING39PUMP-T05N-GRW	X		X
SPRING39PUMP-D05N-GRW		X	X (DOC only)
SPRING39PUMP-T05D-GRW	X, FD		X, FD
SPRING39PUMP-D05D-GRW		X, FD	X, FD (DOC only)
RRUSSPRING39-T05N-SFW	X, MS, LD, SD, PDS		X, MS, LD
RRUSSPRING39-D05N-SFW		X, MS, LD, SD, PDS	X, MS, LD (DOC only)
RRUSSPRING13-T05N-SFW	X		X
RRUSSPRING13-D05N-SFW		X	X (DOC only)
Number water samples	12	12	12
Number MS/MSD or MS/LD	2	2	2
Number Field Duplicates	2	2	2
Number Rinsate Blanks	NA	NA	NA
Number Field Blanks	NA	NA	NA

FD = Field Duplicate MS = Matrix Spike SD = Serial Dilution
PDS = Post-Digestion Spike LD = Laboratory Duplicate DOC = Dissolved Organic Carbon
GRW = Groundwater SFW = Surface Water "RRUS" = Red River Upstream

Table 1-2
Summary of Mixing Water Samples Collected in September 2004

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics
WAT303			
MIX13-T03N-D100	X		
MIX13-D03N-D100		X	
MIX13-T03N-D50	X		X
MIX13-D03N-D50		X	
MIX13-T03N-D20	X		
MIX13-T03D-D20	X, FD		
MIX13-D03N-D20		X	
MIX13-D03D-D20		X, FD	
MIX13-D03N-D05		X, MS, LD, PDS	
MIX13-T03N-D05	X, MS, LD, PDS		
MIX13-D03N-D02.5		X	
MIX13-T03N-T02.5	X		
MIX13-D03N-D00		X	
MIX13-T03N-D00	X		
MIX39-D03N-D50		X	
MIX39-T03N-D50	X		X
MIX39-T03N-D10	X		X
MIX39-D03N-D10		X	
MIX13-D03N-D10		X	
MIX13-T01N-D10	X		X
WAT307			
MIX13-T05N-D00	X		
MIX13-D05N-D00		X, SD	
MIX13-T05N-D02.5	X		X, MS, LD (TOC)
MIX13-D05N-D02.5		X, SD	
MIX13-T05N-D05	X		X, MS, LD (Fluoride)
MIX13-D05N-D05		X	
RB01T-MIX13-D00[1]	X		X
RB01D-MIX13-D00[1]		X	
RB02T-MIX13-D10[1]	X		X
RB02D-MIX13-D10[1]		X	
RB03T-MIX13-D50[1]	X		X
RB03D-MIX13-D50[1]		X	
MIX39-T05N-D10	X		X, MS, LD (Chloride)
MIX39-D05N-D10		X	
MIX39-T05N-D02.5	X		X, MS, LD (Sulfate)
MIX39-D05N-D02.5		X	
WAT314			
MIX13-T07N-D00	X, MS, LD, SD, PDS		
MIX13-D07N-D00		X, MS, LD, SD, PDS	
MIX13-T07N-D02.5	X		X
MIX13-D07N-D02.5		X	
MIX13-T07N-D05	X		X
MIX13-D07N-D05		X	
MIX39-T07N-D00	X		
MIX39-D07N-D00		X	
MIX39-T07D-D00	X, FD		
MIX39-D07D-D00		X, FD	

Table 1-2
Summary of Mixing Water Samples Collected in September 2004

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics
MIX39-T07N-D20	X		X, LD (TDS)
MIX39-T07D-D20			X, FD (TDS, SC, Chloride, Fluoride, Sulfate, pH
MIX39-T07N-D10	X		X
MIX39-D07N-D10		X	
MIX39-T07N-D05	X		X (pH and SC only)
MIX39-T07N-D02.5	X		X, LD (SC, Chloride)
MIX39-D07N-D02.5		X	
MIX13-T07D-D02.5			X, FD (TOC)
Number water samples	22	20	14
Number MS/MSD or MS/LD	2	2	1
Number Field Duplicates	2	2	1
Number Rinsate Blanks[1]	0[1]	0[1]	0[1]
Number Field Blanks	NA	NA	NA

FD = Field Duplicate MS = Matrix Spike SD = Serial Dilution RB = Rinsate Blank
TDS = Total Dissolved Solids PDS = Post-Digestion Spike LD = Laboratory Duplicate TOC = Total Organic Carbon

[1]Samples are not true rinsate blanks. See Section 5.2 for details. Because these samples were not used for exposure to biological organisms, they were excluded from the sample counts.

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, surrogate recoveries, matrix spike recoveries, laboratory duplicate or spike duplicate analysis, post-digestion spike recoveries, ICP serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates, rinsate blanks, field blanks, and trip blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1 and is as follows: if no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used; if no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used; if no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

Section 3.0 lists the data packages used to evaluate laboratory performance parameters and summarizes some general data quality issues. Attachment 1 includes all of the pertinent data validation summary reports for each of the data packages containing samples for this sampling event. In all cases of professional judgment exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative.

The site-specific matrix spike (MS) results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a

given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (MS/MSD results, laboratory duplicate results, and serial dilution results) and associated sample qualification. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for the data packages included in this event. In order to attain the frequency requirements for laboratory performance reviews, three data package (WAT301 and WAT303) were evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identified whether any findings globally affect all relevant samples analyzed for the Serial Dilution study. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

3.2.1 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

3.2.3 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked analytes. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.4 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in section 3.0. STL data package WAT301 and WAT303 were used to evaluate laboratory performance criteria. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated for all packages for this event included:

- Continuing Calibration Verification (CCV) results;
- Initial Calibration Verification (ICV) results; and
- Laboratory Control Sample (LCS) recovery results.

The site-specific matrix spike (MS) results, laboratory duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analysis, LD analyses, and the serial dilution results for the samples collected during the sampling event.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

A few spike recoveries were outside of the QC acceptance limits of 75%-125%. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the magnitude of outages, and the number of valid spike recoveries relative to the size of the sample set.

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the MS exceedances were caused by the sample matrix, a bias in the analytical system, or a combination of both. Recoveries for nearly all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

Table 4-1 illustrates the site-samples that were used to prepare matrix spike samples. As two matrix spikes were prepared and analyzed for total metals, dissolved metals and inorganic parameters for 12 serial dilution samples (excluding field duplicate samples), two matrix spikes were prepared and analyzed for total metals for 22 mixing water samples, two matrix spikes were prepared and analyzed for dissolved metals for 20 mixing water samples, and one matrix spike sample was prepared and analyzed for inorganic parameters for 14 mixing water samples (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Table 4-1
Field Samples Designated for Matrix QC Analysis

Serial Dilution Study Event	Sample ID	Matrix	Data Package	Analyses
Serial Dilution	RRUSSPG13-T03N-SFW	Water	WAT301	Total Metals, Inorganic Parameters
	RRUSSPG13-D03N-SFW	Water	WAT301	Dissolved Metals, Inorganic Parameters
	RRUSSPG39-T03N-SFW	Water	WAT310	Total Metals, Inorganic Parameters
	RRUSSPG39-D03N-SFW	Water	WAT310	Dissolved Metals, Inorganic Parameters
Mixing Water	MIX13-D03N-D05	Water	WAT303	Dissolved Metals
	MIX13-T03N-D05	Water	WAT303	Total Metals
	MIX13-D07N-D00	Water	WAT314	Dissolved Metals
	MIX13-T07N-D00	Water	WAT314	Total Metals
	MIX13-T05N-D02.5	Water	WAT307	TOC
	MIX13-T05N-D05	Water	WAT307	Fluoride
	MIX39-T05N-D10	Water	WAT307	Chloride
	MIX39-T05N-D02.5	Water	WAT307	Sulfate

Spring was abbreviated as SPG

4.1.1 Serial Dilution Matrix Spike Results

Table 4-2 summarizes the serial dilution water results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Table 4-2
Inorganics Matrix Spike Results for Serial Dilution Water

Analyte	Total				Dissolved				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Aluminum	2	0	0	109	2	0	0	1012	None
Antimony	2	0	0	97	2	0	0	97	None
Arsenic	2	0	0	95	2	0	0	92	None
Barium	2	0	0	102	2	0	0	94	None
Beryllium	2	0	0	109	2	0	0	104	None
Boron	2	0	0	106	2	0	0	99	None
Cadmium	2	0	0	95	2	0	0	95	None
Chromium	2	0	0	107	2	0	0	101	None
Cobalt	2	0	0	105	2	0	0	100	None
Copper	2	0	0	102	2	0	0	103	None
Iron	2	0	0	113	2	0	0	108	None
Lead	2	0	0	105	2	0	0	105	None
Manganese	2	0	0	106	2	0	0	100	None
Nickel	2	0	0	104	2	0	0	104	None
Selenium	2	0	0	85	2	0	0	86	None
Molybdenum	2	0	0	102	2	0	0	103	None
Silver	2	0	0	119	2	0	0	113	None
Thallium	2	0	0	106	2	0	0	111	None
Vanadium	2	0	0	102	2	0	0	102	None
Zinc	2	0	0	106	2	0	0	100	None
Cyanide	2	0	0	115	N/A	N/A	N/A	N/A	None
Chloride	2	0	0	107	N/A	N/A	N/A	N/A	None
Nitrate/Nitrite	2	0	0	91	N/A	N/A	N/A	N/A	None
Total Alkalinity	2	0	0	107	N/A	N/A	N/A	N/A	None
Fluoride	2	0	0	97	N/A	N/A	N/A	N/A	None
Nitrite	2	0	0	116	N/A	N/A	N/A	N/A	None
Orthophosphorous	2	0	0	104	N/A	N/A	N/A	N/A	None
Phosphorous	2	0	0	101	N/A	N/A	N/A	N/A	None
Sulfate	2	0	0	88	N/A	N/A	N/A	N/A	None
TOC	2	0	**1**	136	N/A	N/A	N/A	N/A	None
DOC	N/A	N/A	N/A	N/A	2	0	0	112	None

With one exception, all serial dilution water sample matrix spike recoveries were within the acceptance limits. For TOC, 50% of the matrix spike recoveries were out of the acceptance limits. However, data qualification was not extended to all samples due to limited size of the sample set (i.e. 12 samples). With such a small sample set, and because the water chemistry between Spring 39 and Spring 13 is different, the number of QC samples was considered insufficient for discerning whether or not a generalized matrix effect exits. Because the TOC

result for sample RRUSSG39T05N-SFW was reported as nondetect and the potential bias is considered to be high, data qualification was not considered necessary for the parent sample.

4.1.2 Mixing Water Matrix Spike Results

Table 4-3 summarizes the mixing water results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Table 4-3
Inorganics Matrix Spike Results for Mixing Water

Analyte	Total				Dissolved				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Aluminum	2	0	0	107	2	0	0	106	None
Antimony	N/A	N/A	N/A	N/A	2	0	0	98	None
Arsenic	N/A	N/A	N/A	N/A	2	0	0	95	None
Barium	N/A	N/A	N/A	N/A	2	0	0	98	None
Beryllium	N/A	N/A	N/A	N/A	2	0	0	104	None
Boron	N/A	N/A	N/A	N/A	2	0	0	101	None
Cadmium	N/A	N/A	N/A	N/A	2	0	0	96	None
Chromium	N/A	N/A	N/A	N/A	2	0	0	101	None
Cobalt	N/A	N/A	N/A	N/A	2	0	0	99	None
Copper	N/A	N/A	N/A	N/A	2	0	0	103	None
Iron	2	0	0	105	2	0	0	105	None
Lead	N/A	N/A	N/A	N/A	2	0	0	106	None
Manganese	N/A	N/A	N/A	N/A	2	0	0	101	None
Nickel	N/A	N/A	N/A	N/A	2	0	0	104	None
Selenium	N/A	N/A	N/A	N/A	2	0	0	83	None
Molybdenum	N/A	N/A	N/A	N/A	2	0	0	104	None
Silver	N/A	N/A	N/A	N/A	2	0	0	116	None
Thallium	N/A	N/A	N/A	N/A	2	0	0	106	None
Vanadium	N/A	N/A	N/A	N/A	2	0	0	102	None
Zinc	N/A	N/A	N/A	N/A	2	0	0	100	None
Chloride	1	**1**	0	26	N/A	N/A	N/A	N/A	**J (MS-L) Parent Sample Only**
Fluoride	1	0	0	92	N/A	N/A	N/A	N/A	None
Sulfate	1	0	0	90	N/A	N/A	N/A	N/A	None
TOC	1	0	**1**	136	N/A	N/A	N/A	N/A	**J (MS-H) Parent Sample Only**

With two exceptions, all mixing water sample matrix spike recoveries were within the acceptance limits. Although 50% of the matrix spike recoveries were out of the acceptance limits for TOC and chloride, data qualification was not extended to all samples due to limited size of the sample set (i.e. 22 samples). With such a small sample set, and because the water chemistry between Spring 39 and Spring 13 is different, the number of QC samples was considered insufficient for discerning whether or not a generalized matrix effect exits. Therefore, only the parent sample results were qualified for chloride and TOC.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The relative percent differences (RPD) criterion ≤20% (≤35% for sediments) was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL (less than two times the greater RL for sediment). For metals data, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL, and the IDLs were considered to be too low to be used as the baseline for these concentration dependent evaluations.

Table 4-4 illustrates the site-samples that were used to prepare laboratory duplicate samples. Two laboratory duplicates were prepared and analyzed for total metals, dissolved metals and inorganic parameters for 12 serial dilution water field sample sites (excluding field duplicate samples). Two laboratory duplicates were prepared and analyzed for dissolved metals for 20 mixing water field samples (excluding field duplicate samples), two laboratory duplicate samples were prepared and analyzed for total metals for 22 mixing water field samples (excluding field duplicate samples), and one laboratory duplicate was prepared and analyzed for inorganic parameters for 14 mixing water field samples (excluding field duplicate samples). Therefore, the QAPP frequency for matrix QC samples (5%) was satisfied.

Table 4-4
Inorganics Laboratory Duplicate Results

Serial Dilution Study Event	Sample ID	Matrix	Data Package	Analyses
Serial Dilution	RRUSSPG13-D03N-SFW	Water	WAT301	Dissolved Metals, Inorganic Parameters
	RRUSSPG13-T03N-SFW	Water	WAT301	Total Metals, Inorganic Parameters
	RRUSSPG39-D03N-SFW	Water	WAT310	Dissolved Metals, Inorganic Parameters
	RRUSSPG39-T03N-SFW	Water	WAT310	Total Metals, Inorganic Parameters
Mixing Water	MIX13-D03N-D05	Water	WAT303	Dissolved Metals
	MIX13-T03N-D05	Water	WAT303	Total Metals
	MIX13-D07N-D00	Water	WAT314	Dissolved Metals
	MIX13-D07N-D00	Water	WAT314	Total Metals
	MIX13-T05N-D02.5	Water	WAT307	TOC
	MIX13-T05N-D05	Water	WAT306	Fluoride
	MIX39-T05N-D10	Water	WAT307	Chloride
	MIX39-T05N-D02.5	Water	WAT307	Sulfate
	MIX39-T07N-D20	Water	WAT314	TDS
	MIX39-T07N-D02.5	Water	WAT314	pH, SC

The RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within the QAPP acceptance limits for all laboratory duplicate analyses.

4.3 SERIAL DILUTION RESULTS

Serial dilution tests involve the analysis of a sample and a five-fold dilution of the same sample. When analyte concentrations are sufficiently high (i.e., greater that 50x the instrument detection limit [IDL]), the original result and diluted sample result are expected to be fairly comparable. If the results are not comparable, it is generally assumed that there are matrix interferences that are resulting in the suppression or elevation of the signal for one or more analytes.

The original and diluted sample results are compared by a percent difference (%D). When %Ds ≤10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate that the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result. As illustrated by the Table 4-5 below, serial dilution tests were conduced on four serial dilution samples and six mixing water samples.

Table 4-5
ICP Serial Dilution Samples

Serial Dilution Study Event	Sample ID	Matrix	Data Package	Analyses
Serial Dilution	RRUSSPG13-D03N-SFW	Water	WAT301	Dissolved Metals
	RRUSSPG13-T03N-SFW	Water	WAT301	Total Metals
	RRUSSPG39-D03N-SFW	Water	WAT310	Dissolved Metals
	RRUSSPG39-T03N-SFW	Water	WAT310	Total Metals
Mixing Water	MIX13-D03N-D05S	Water	WAT303	Dissolved Metals
	MIX13-T03N-D05S	Water	WAT303	Total Metals
	MIX-D05N-D00	Water	WAT303	Dissolved Metals
	MIX-13-D05N-D02.5	Water	WAT303	Dissolved Metals
	MIX13-D07N-D00S	Water	WAT314	Dissolved Metals
	MIX13-T07N-D00S	Water	WAT314	Total Metals

A number of %Ds between the original sample results and the result obtained from a sample diluted 1:5 were >10%. In general, qualification was generally limited to the parent samples if less than a quarter of the valid serial dilution results for a given metal were outside of the acceptance range. Conversely, qualification was generally considered necessary if more than a quarter of the results for a metal were outside the acceptance range. However, factors such as the number of valid measurements relative to the size of the sample set and the magnitude of outages were also taken into consideration.

4.3.1 Serial Dilution Water Serial Dilution Results

Table 4-6 summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued for all serial dilution water results.

Table 4-6
ICP Serial Dilution Results for Serial Dilution Water

Analyte	Total Metals					Dissolved Metals					Action
	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		
				Low	High				Low	High	
Aluminum	2	0	6	0	0	2	0	4.9	0	0	None
Antimony	2	0	5.9	0	0	2	0	6	0	0	None
Arsenic	2	0	5.9	0	0	2	**1**	10.7	1	0	**UJ (DL-L) Parent Sample Only**
Barium	2	0	4	0	0	2	0	6.0	0	0	None
Beryllium	2	0	3.5	0	0	2	0	6.8	0	0	None
Boron	2	0	3.9	0	0	2	0	8.8	0	0	None
Cadmium	2	0	5.8	0	0	2	0	6.8	0	0	None
Calcium	2	0	4.3	0	0	2	0	6.4	0	0	None
Chromium	2	0	4.1	0	0	2	0	4.9	0	0	None
Cobalt	2	0	3.9	0	0	2	0	6.3	0	0	None
Copper	2	0	1.7	0	0	2	0	3	0	0	None
Iron	2	0	2.8	0	0	1	0	6.6	0	0	None
Lead	2	0	0.8	0	0	2	0	1.8	0	0	None
Magnesium	.0	0	---	0	0	1	0	5.2	0	0	None
Manganese	2	0	3.9	0	0	2	0	6.4	0	0	None
Nickel	2	0	3.0	0	0	2	0	2	0	0	None
Selenium	2	**2**	**16**	2	0	2	**2**	**20.8**	2	0	**J/UJ (DL-L) All selenium results**
Molybdenum	2	0	2	0	0	2	0	1	0	0	None
Silver	2	0	4.4	0	0	2	0	2.8	0	0	None
Potassium	0	0	---	0	0	0	0	--	0	0	None
Thallium	2	0	1.9	0	0	2	0	3	0	0	None
Vanadium	2	0	1.3	0	0	2	0	1.2	0	0	None
Sodium	0	0	---	0	0	0	0	--	0	0	None
Zinc	2	0	3.8	0	0	2	0	0	0	0	None

Although 50% of the serial dilution results were out of the criterion for dissolved arsenic, data qualification was not extended to all samples due to limited size of the sample set (i.e. 12 samples) and the fact that the exceedance was considered marginal (11.2%). With such a small sample set and because the water chemistry between Spring 39 and Spring 13 is different, the number of QC samples was considered insufficient for discerning whether or not a generalized matrix effect exits. Therefore, only the parent sample dissolved arsenic result was qualified based on serial dilution results.

For selenium, four (two total and two dissolved results) of four valid serial dilution results, as well as the average percent difference, were outside QC acceptance limits. Therefore, qualification based on serial dilution results was applied to all selenium results.

4.3.2 Mixing Water Serial Dilution Results

The table below summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued for all Mixing Water results.

Table 4-7
ICP Serial Dilution Results for Mixing Water

Analyte	Total Metals					Dissolved Metals					Action
	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		
				Low	High				Low	High	
Aluminum	2	0	2.7	0	0	2	0	2.7	0	0	None
Antimony	N/A	N/A	N/A	N/A	N/A	2	0	3.5	0	0	None
Arsenic	N/A	N/A	N/A	N/A	N/A	2	0	4.8	0	0	None
Barium	N/A	N/A	N/A	N/A	N/A	2	0	1.9	0	0	None
Beryllium	N/A	N/A	N/A	N/A	N/A	2	0	1.7	0	0	None
Boron	N/A	N/A	N/A	N/A	N/A	2	0	2.3	0	0	None
Cadmium	N/A	N/A	N/A	N/A	N/A	2	0	1.5	0	0	None
Calcium	N/A	N/A	N/A	N/A	N/A	3	0	2.4	0	0	None
Chromium	N/A	N/A	N/A	N/A	N/A	2	0	1.4	0	0	None
Cobalt	N/A	N/A	N/A	N/A	N/A	2	0	2.1	0	0	None
Copper	N/A	N/A	N/A	N/A	N/A	2	0	1.6	0	0	None
Iron	2	0	3.8	0	0	2	0	5.3	0	0	None
Lead	N/A	N/A	N/A	N/A	N/A	2	0	4.4	0	0	None
Magnesium	N/A	N/A	N/A	N/A	N/A	0	0	---	0	0	None
Manganese	N/A	N/A	N/A	N/A	N/A	3	0	2.3	0	0	None
Nickel	N/A	N/A	N/A	N/A	N/A	3	**1**	8.3	0	1	**J (DL-H) Parent Sample Only**
Selenium	N/A	N/A	N/A	N/A	N/A	2	**1**	14.7	1	0	**J (DL-L) Parent Sample Only**
Molybdenum	N/A	N/A	N/A	N/A	N/A	2	0	2.8	0	0	None
Silver	N/A	N/A	N/A	N/A	N/A	.2	0	1.9	0	0	None
Potassium	N/A	N/A	N/A	N/A	N/A	0	0	---	0	0	None
Thallium	N/A	N/A	N/A	N/A	N/A	2	0	6.0	0	0	None
Vanadium	N/A	N/A	N/A	N/A	N/A	2	0	2.3	0	0	None
Sodium	N/A	N/A	N/A	N/A	N/A	1	0	4.8	0	0	None
Zinc	N/A	N/A	N/A	N/A	N/A	2	0	4.0	0	0	None

Although 33% (1 out of 3) of the serial dilution results were out of the criterion for dissolved nickel, data qualification was not extended to all samples due to limited size of the sample set (i.e. 22 samples) and because the average %D was within limits. With such a small sample set, and because the water chemistry between Spring 39 and Spring 13 is different, the number of QC samples was considered insufficient for discerning whether or not a generalized matrix effect exits. Therefore, only the parent sample dissolved nickel result was qualified based on serial dilution results.

Although 50% of the serial dilution were out of the criterion for dissolved selenium, data qualification was not extended to all samples due to limited size of the sample set (i.e. 22 samples). With such a small sample set, and because the water chemistry between Spring 39 and

Spring 13 is different, the number of QC samples was considered insufficient for discerning whether or not a generalized matrix effect exits. Therefore, only the parent sample dissolved selenium result was qualified based on serial dilution results.

The site-specific blanks (field and rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. Field duplicate agreement was assessed to determine the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. The following sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

Table 5-1 presents the field duplicate samples collected for this event. Two field duplicates were prepared and analyzed for total metals, dissolved metals and inorganic parameters for 12 serial dilution water field sample sites (excluding field duplicate samples), two laboratory duplicates were prepared and analyzed for dissolved metals for 20 mixing water field sample sites (excluding field duplicate samples). Two field duplicate samples were prepared and analyzed for total metals for 22 mixing water field sample sites (excluding field duplicate samples), and one laboratory duplicate was prepared and analyzed for inorganic parameters for 14 mixing water field sample sites (excluding field duplicate samples). Therefore, the QAPP frequency for matrix QC samples (5%) was satisfied

Table 5-1
Summary of Field Duplicate Serial Dilution Study Samples Collected

Serial Dilution Study	Sample ID	Matrix	Data Package	Analyses
Serial Dilution	SPRING13PUMP-T01N-GRW/ SPRING13PUMP-T01D-GRW	Water	WAT301	Total Metals, Inorganics
	SPRING13-D01N-GRW/ SPRING13-D01D-GRW	Water	WAT301	Dissolved Metals, DOC
	SPRING39PUMP-T05N-SFW/ SPRING39PUMP-T05D-SFW	Water	WAT310	Total Metals, Inorganics
	SPRING39PUMP-D05N-SFW/ SPRING39PUMP-D05D-SFW	Water	WAT310	Dissolved Metals, DOC
Mixing Water	MIX39-T07N-D20/ MIX39-T07D-D20	Water	WAT314	Total Metals, Inorganics
	MIX39-D07N-D00/ MIX39-D07D-D00	Water	WAT314	Dissolved Metals
	MIX13-T07N-D02.5/ MIX13-T07D-D02.5	Water	WAT314	TOC
	MIX13-T03N-D20/ MIX13-T03D-D20	Water	WAT303	Total Metals,
	MIX13-D03N-D20/ MIX13-D03N-D20	Water	WAT303	Dissolved Metals

5.1 FIELD DUPLICATE RESULTS

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤30% (≤50% for sediments) was applied for cases in which both the sample and field duplicate concentration were greater than five times the RL. For field duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than two times the greater RL

(<3.5xRL for sediments). For metals data, the CRDL is used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL and the IDL was considered to be too low to be used as the baseline for these concentration dependent evaluations. With one exception, the applicable evaluation criterion was met. The exception and the resultant data qualifiers are summarized in the table below.

Table 5-2
Summary of Field Duplicate Serial Dilution Study Sample Exceedances

Serial Dilution Event	Analyte	Sample ID	Criterion	Criterion Exceedance	Action
Serial Dilution	Nitrate/Nitrite	SRPING13PUMP-T01N-GRW/ SRPING13PUMP-T01D-GRW	AD ≤2x RL	AD > 2x RL	J FD-I for parent samples only.

RL = Reporting Limit
AD = Absolute Difference

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. No rinsate blanks were collected in association with the serial dilution water samples as dedicated sampling equipment was used. Three rinsate blank samples were collected in association with the mixing water samples (RB01T/D-MIX13-D00, RB02T/D-MIX13-D10, and RB03T/D-MIX13-D50).

RB01T/D-MIX13-D00 is a sample of the laboratory reconstituted water used in some of Chadwick's (CEC) dilution tests in place of Red River water. This water was stored in a cubitainer like those used to collect and store the site water samples. Thus, this sample is more akin to a field blank sample.

The other two rinsate blank samples, RB02T/D-MIX13-D10 and RB03T/D-MIX13-D50, are mixes of Spring 13 water and Red River water collected upstream of Spring 13. The D10 is 10% Spring 13 water and the D50 is 50% Spring 13 water. These mixtures were then treated as if they were being used in the bioassay except that CEC did not add any fish to the water. Thus, they represent the fish-absent water modified by the geochemical reactions that happen upon mixing.

The three rinsate blank samples are considered QC samples, but they are not true rinsate blanks and the results were not used for qualifying data during validation.

5.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field blanks are only required by the QAPP when samples are analyzed for organics. Therefore, no field blanks were collected in association with the samples collected during this sample event.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

For the serial dilution study sampling event (serial dilution water samples and mixing water samples), 99% of the field duplicate and 100% of the laboratory results satisfied the applicable criteria. As such, the overall level of precision demonstrated is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery for LCS and MS samples.

All of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP, which is considered to be indicative of acceptable overall accuracy with respect to the analytical system.

The MS recoveries suggested that the overall accuracy attained with respect to the site-specific sample matrices are satisfactory as 99% and 96% of the MS recoveries for the serial dilution samples and mixing water samples, respectively, were within the QAPP acceptance range of 75-125%. Sample results were qualified accordingly as estimated due to low or high matrix spike recoveries.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results for the samples analyzed are considered usable as qualified for meeting project objective. As such, the completeness for the samples analyzed is 100%, which satisfies the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the surface water samples. The close agreement between the field duplicate results is considered to indicate that the samples collected are adequately representative of the medium sampled.

Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. As noted in Section 4.2, the laboratory duplicate results satisfied the precision evaluation indicating that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

All RLs obtained, except for cyanide results, met the QAPP specified RL requirements for aqueous media for which there was screening level criteria provided in the QAPP or the Baseline Ecological Risk Assessment to which RLs for nondetect analytes could be compared.

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the Spring 13 and 39 Sampling Event.

Attachments

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT301

Sampling Events: September 2004 Serial Dilution Study

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **Yes**

Data Reviewer: Jennifer Winnike/Sheri O'Connor

Date Completed: 10/18/04

Peer Reviewer: Stacey Coker

Date Completed: 12/20/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Analyses		
				Matrix	Metals	Inorganics
SPRING13PUMP-T01N-GRW	SA	587749	SPRING13PUMP-T01N-GR	W	X	X
SPRING13PUMP-D01N-GRW	SA	587750	SPRING13PUMP-D01N-G	W	X	X[2]
SPRING13PUMP-T01D-GRW	FD	587751	SPRING13PUMP-T01D-GR	W	X	X
SPRING13PUMP-D01D-GRW	FD	587752	SPRING13PUMP-D01D-G	W	X	X[2]
SPRING39PUMP-T01N-GRW	SA	587753	SPRING39PUMP-T01N-GR	W	X	X
SPRING39PUMP-D01N-GRW	SA	587754	SPRING39PUMP-D01N-G	W	X	X[2]
RRUSSPRING13-T01N-SFW	SA	587755	RRUSSPRING13-T01N-SF	W	X	X
RRUSSPRING13-D01N-SFW	SA	587756	RRUSSPRING13-D01N-SF	W	X	X[2]
RRUSSPRING39-T01N-SFW	SA	587757	RRUSSPRING39-T01N-SF	W	X	X
RRUSSPRING39-D01N-SFW	SA	587758	RRUSSPRING39-D01N-SF	W	X	X[2]
SPRING13PUMP-T03N-SFW	SA	588000	SPRING13PUMP-T03N-SF	W	X	X
SPRING13PUMP-D03N-SFW	SA	588001	SPRING13PUMP-D03N-SF	W	X	X[2]
SPRING39PUMP-T03N-SFW	SA	588002	SPRING39PUMP-T03N-SF	W	X	X
SPRING39PUMP-D03N-SFW	SA	588003	SPRING39PUMP-D03N-SF	W	X	X[2]
RRUSSPRING39-T03N-SFW	SA	588004	RRUSSPRING39-T03N-SF	W	X	X
RRUSSPRING39-D03N-SFW	SA	588005	RRUSSPRING39-D03N-SF	W	X	X[2]
RRUSSPRING13-T03N-SFW	SA, MS, MSD	588006	RRUSSPRING13-T03N-SF	W	X	X
RRUSSPRING13-D03N-SFW	SA, MS, MSD	588007	RRUSSPRING13-D03N-SF	W	X	X[2]

Matrix: W = Water FD = Field Duplicate

QC Type: SA = Sample MS = Matrix Spike

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Analyzed for dissolved organic carbon (DOC) only.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks	No	Chloride was detected in the method blanks run on 9/29/04 and 10/02/04. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD RRUSPRRING13-T03N-SFW RRUSSPRING13-D03N-SFW • LD RRUSSPRING13-T03N-SFW RRUSSPRING13-D03N-SFW	Yes	All matrix QC sample results were within evaluation criteria. Therefore, no qualifications of data were necessary. The matrix quality control results for the September 2004 Serial Dilution Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RRUSPRRING13-T03N-SFW RRUSSPRING13-D03N-SFW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses were run on the matrix spikes of samples RRUSSPRING13-T03N-SFW and RRUSSPRING13-D03N-SFW. For both samples, the serial dilution results were applicable for 21 of the 24 analytes. Some of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. Two results for sample RRUSSPRING13-D03N-SFW and one result for sample RRUSSPRING13-T03N-SFW were outside the evaluation criterion. Table 1.2 summarizes the outlying %Ds and the resultant data qualifications. The serial dilution results for the September 2004 Serial Dilution Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. With one exception, all reported cation/ anion balances met this criterion. For sample RRUSSSPRING39-T/D03N-SFW, the cation/ anion % difference was –17.18%. As the concentrations were low enough that the reporting limits controlled the calculations, the cation/anion % difference was not considered representative of this comparison and therefore did not result in data qualification. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances.
Field QC • Field Duplicate SPRING13PUMP-T01N-GRW SPRING13PUMP-T01D-GRW SPRING13PUMP-D01N-GRW SPRING13PUMP-D01D-GRW • Rinsate Blank	No	All field duplicate results were within evaluation criteria, except for the nitrate/nitrite results for field duplicate samples SPRING13PUMP-T01N-GRW/ SRPING13PUMP-T01D-GRW. The nitrate/nitrate results for the parents sample and duplicate were qualified as estimated (**J FD-I**). The field QC results for the September 2004 Serial Dilution Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the Spring 13 and 39 Sampling Event.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	
Review Parameter	**Criteria Met?**	**Comments**
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	The percent recovery for the closing calibration verification standard for the nitrate/ nitrite analysis on 09/27/04 exceeded the control limits of 90-110% with a recovery of 112%. Nitrate/nitrite results for samples SPRING39PUMP-T01N-GRW and RRUSPRING13-T01N-SFW were qualified as estimated (**J CCV-H**).
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	N/A	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu were not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. Acceptable performance is inferred from ongoing acceptable QC sample results.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Chloride 10/02/04	---	---	---	---	---	0.84	0.20	SPRING13PUMP-T01N-GRW SPRING13PUMP-T01D-GRW SPRING13PUMP-T03N-SFW SPRING39PUMP-T03N-SFW	U MB-I
Antimony 10/11/04	1.2	1.2	1.3	1.3	---	0.985	0.30	RRUSSPRING13-T01N-SFW RRUSSPRING13-T03N-SFW RRUSSPRING39-T01N-SFW RRUSSPRING30-T03N-SFW	U CCB, MB-I
Antimony 9/27/04	0.9	0.9	0.8	---	---	0.497	0.30	RRUSSPRING13-D01N-SFW RRUSSPRING39-D01N-SFW RRUSSPRING39-D03N-SFW	U CCB, MB-I
Arsenic	---	---	---	---	---	-0.166	0.10	RRUSSPRING13-T01N-SFW RRUSSPRING13-T03N-SFW RRUSSPRING39-T01N-SFW RRUSSPRING30-T03N-SFW	J/UJ MB-L
Boron	7.3	6.2	4.9	4.9	5.3	3.684	3.0	RRUSSPRING13-D01N-SFW RRUSSPRING13-D03N-SFW RRUSSPRING39-D01N-SFW RRUSSPRING39-D03N-SFW SPRING13PUMP-D01N-GRW SPRING13PUMP-D03N-SFW	U CCB, MB-I
Cadmium	---	---	-0.1	---	---	---	0.10	RRUSSPRING13-D01N-SFW RRUSSPRING39-D01N-SFW	UJ CCB-L
Copper	-1.0	-1.0	-1.0	-1.0	---	3.778	0.30	RRUSSPRING13-T01N-SFW RRUSSPRING13-T03N-SFW RRUSSPRING39-T01N-SFW RRUSSPRING30-T03N-SFW	U MB-I
Molybdenum 10/11/04	0.6	---	---	---	---	0.457	0.40	RRUSSPRING13-T01N-SFW RRUSSPRING13-T03N-SFW RRUSSPRING39-T01N-SFW RRUSSPRING30-T03N-SFW	U MB-I
Molybdenum 9/27/04	0.8	0.7	0.7	---	---	0.608	0.40	RRUSSPRING13-D01N-SFW RRUSSPRING13-D03N-SFW RRUSSPRING39-D01N-SFW RRUSSPRING39-D03N-SFW	U CCB, MB-I
Potassium	---	233.5	---	---	---	---	196.5	SPRING13PUMP-D03N-SFW SPRING39PUMP-D03N-SFW	U CCB-I
Selenium	---	-0.2	-0.3	---	---	-0.213	0.20	RRUSSPRING13-D01N-SFW RRUSSPRING13-D03N-SFW RRUSSPRING39-D01N-SFW RRUSSPRING39-D03N-SFW SPRING13PUMP-D01D-GRW SPRING13PUMP-D01N-GRW SPRING13PUMP-D03N-SFW SPRING39PUMP-D01N-GRW SPRING39PUMP-D03N-SFW	J/UJ CCB, MB-L
Vanadium	-0.1	---	---	---	---	---	0.10	RRUSSPRING13-D03N-SFW RRUSSPRING39-D03N-SFW SPRING13PUMP-D03N-SFW SPRING39PUMP-S03N-SFW	UJ CCB-L
Zinc	---	---	---	---	---	2.743	1.8	SPRING13PUMP-D01N-GRW SPRING13PUMP-D03N-SFW	U MB-I

CCBx-Continuing Calibration Blank RL = Reporting limit IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	Sample Result (ug/L)	Serial Dilution Result (ug/L)	%D	Qualification
RRUSSPRING13-T03N-SFW				
Selenium	16.93	18.78	10.9	UJ DL-L
RRUSSPRING13-D03N-SFW				
Arsenic	18.07	19.89	10.1	None, %D rounds to 10
Selenium	15.3	18.97	24.0	UJ DL-L

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT303 Sampling Events: September 2004 Serial Dilution Study

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **Yes**

Data Reviewer: Jennifer Winnike/Sheri O'Connor Date Completed: 11/22/04

Peer Reviewer: Stacey Coker Date Completed: 12/06/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals[2]	Inorganics
MIX13-T03N-D100	SA	588028		W	X	
MIX13-D03N-D100	SA	588029		W	X	
MIX13-T03N-D50	SA	588030		W	X	X
MIX13-D03N-D50	SA	588031		W	X	
MIX13-T03N-D20	SA	588032		W	X	
MIX13-T03D-D20	FD	588033		W	X	
MIX13-D03N-D20	SA	588034		W	X	
MIX13-D03D-D20	FD	588035		W	X	
MIX13-D03N-D05	SA, MS, LD	588036		W	X	
MIX13-T03N-D05	SA, MS, LD	588037		W	X	
MIX13-D03N-D02.5	SA	588038		W	X	
MIX13-T03N-T02.5	SA	588039		W	X	
MIX13-D03N-D00	SA	588040		W	X	
MIX13-T03N-D00	SA	588041		W	X	
MIX39-D03N-D50	SA	588042		W	X	
MIX39-T03N-D50	SA	588043		W	X	X
MIX39-T03N-D10	SA	588044		W	X	X
MIX39-D03N-D10	SA	588045		W	X	
MIX13-D03N-D10	SA	588046		W	X	
MIX13-T03N-D10	SA	588047		W	X	X

Matrix: W = Water FD = Field Duplicate

QC Type: SA = Sample MS = Matrix Spike LD = Laboratory Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Total metals includes Aluminum and Iron only

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken 5 days after the samples were logged-in. The pH measurements were taken the day after the samples were logged-in. Table 1 summarizes the results that exceeded holding time and the resultant data qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD MIX13-T03N-D05 MIX13-D03N-D05 • LD MIX13-T03N-D05 MIX13-D03N-D05	Yes	All matrix QC sample results were within evaluation criteria. Therefore, no qualifications of data were necessary. The matrix quality control results for the September 2004 Serial Dilution Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MIX13-T03N-D05 MIX13-D03N-D05 • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses were run on the matrix spikes of samples MIX13-T03N-D05 and MIX13-D03N-D05. For sample MIX13-T03N-D05 the serial dilution results were applicable for both analytes reported. For sample MIX13-D03N-D05, the serial dilution results were applicable for 22 of the 24 analytes. Some of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. No qualifications of data were necessary. The serial dilution results for the September 2004 Serial Dilution Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The cation/ anion balance could not be calculated since all of the constituents were not analyzed in this SDG.
Field QC • Field Duplicate MIX13-T03N-D20 MIX13-T03D-D20 MIX13-D03N-D20 MIX13-D03D-D20 • Rinsate Blank	Yes	All field duplicate results were within evaluation criteria. No qualifications of data were necessary. The field QC results for the September 2004 Serial Dilution Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the Serial Dilution Study.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	

Review Parameter	Criteria Met?	Comments
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	During the TOC analysis of 10/27/04, the calibration check standards designated as CCV2 and CCV3 yielded percent recoveries that were outside control criteria. The recoveries were 84% and 114%, respectively, outside the acceptance range of 90-110%. Since the samples in this SDG were not associated with these two CCVs, no qualifications of data were necessary.
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	N/A	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu were not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. Acceptable performance is inferred from ongoing acceptable QC sample results.

Table 1
Holding Time Qualifications for Inorganics

Sample	Cond. (μmhos/cm)	pH (std units)
MIX13-T03N-D50	1040 J	4.6 J
MIX39-T03N-D50	855 J	5.8 J
MIX39-T03N-D10	384 J	6.9 J
MIX13-T03N-D10	411 J	6.7 J

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum	---	---	38.1	37.3	69.3	37.2	---	34.1	MIX13-D03N-D00 MIX13-D03N-D02.5 MIX13-D03N-D05 MIX13-D03N-D10 MIX39-D03N-D10	U CCB-I
Antimony	0.7	0.7	0.6	---	---	---	0.317	030	MIX13-D03N-D00 MIX13-D03N-D02.5	
Arsenic	-0.2	-0.1	-0.1	---	---	---	-0.199	0.10	MIX13-D03D-D20 MIX13-D03N-D00 MIX13-D03N-D02.5 MIX13-D03N-D05 MIX13-D03N-D10 MIX13-D03N-D20 MIX39-D03N-D10	J/UJ CCB, MB-L
Boron	---	---	-7.0	-7.0	-7.3	-7.8	---	6.9	MIX13-D03D-D20 MIX13-D03N-D00 MIX13-D03N-D02.5 MIX13-D03N-D05 MIX13-D03N-D10 MIX13-D03N-D20 MIX13-D03N-D50 MIX39-D03N-D10 MIX39-D03N-D50	UJ CCB-L
Cadmium	-0.2	-0.2	-0.2	---	---	---	-0.249	0.10	MIX13-D03N-D00 MIX13-D03N-D02.5 MIX13-D03N-D05 MIX39-D03N-D10	J/UJ CCB, MB-L
Copper	-1.3	-1.2	-1.3	---	---	---	6.466	0.30	MIX13-D03N-D00 MIX13-D03N-D02.5 MIX13-D03N-D05 MIX13-D03N-D10	U MB-I
Copper	---	---	---	---	5.6	---	---	2.6	MIX13-D03N-D50	U CCB-I
Iron	---	---	-49.5	---	---	---	---	35.5	MIX39-D03N-D10	UJ CCB-L
Molybdenum	0.7	-0.7	-0.8	---	---	---	---	2.0	MIX13-D03N-D00 MIX13-D03D-D20 MIX13-D03N-D02.5 MIX13-D03N-D05 MIX13-D03N-D10	J/ UJ CCB-L
Selenium	-0.3	---	---	---	---	---	-0.374	030	MIX13-D03D-D20 MIX13-D03N-D05 MIX13-D03N-D100 MIX13-D03N-D20 MIX13-D03N-D50	J/UJ CCB, MB-L
									MIX13-D03N-D00 MIX13-D03N-D02.5 MIX13-D03N-D10 MIX39-D03N-D10 MIX39-D03N-D50	UJ MB-L
Silver	-0.2	-0.2	-0.2	---	---	---	-0.197	010	MIX13-D03D-D20 MIX13-D03N-D00 MIX13-D03N-D02.5 MIX13-D03N-D05 MIX13-D03N-D10 MIX13-D03N-D100 MIX13-D03N-D20 MIX13-D03N-D50 MIX39-D03N-D10 MIX39-D03N-D50	UJ CCB, MB-L

CCBx-Continuing Calibration Blank RL = IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT307

Sampling Events: September 2004 Serial Dilution Study

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike

Date Completed: 10/26/04

Peer Reviewer: Stacey Coker

Date Completed: 11/22/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals[2]	Inorganics
MIX13-T05N-D00	SA	588492		W	X	
MIX13-D05N-D00	SA	588493		W	X	
MIX13-T05N-D02.5	SA, MS, LD	588494		W	X	X
MIX13-D05N-D02.5	SA	588495		W	X	
MIX13-T05N-D05	SA	588496		W	X	X
MIX13-D05N-D05	SA, MS, LD	588497		W	X	
RB01T-MIX13-D00	SA	588498		W	X	X
RB01D-MIX13-D00	SA	588499		W	X	
RB02T-MIX13-D10	SA	588500		W	X	X
RB02D-MIX13-D10	SA	588501		W	X	
RB03T-MIX13-D50	SA	588502		W	X	X
RB03D-MIX13-D50	SA	588503		W	X	
MIX39-T05N-D10	SA, MS, LD	588504		W	X	X
MIX39-D05N-D10	SA	588505		W	X	
MIX39-T05N-D02.5	SA, MS, LD	588506		W	X	X
MIX39-D05N-D02.5	SA	588507		W	X	

Matrix: W = Water LD = Laboratory Duplicate

QC Type: SA = Sample MS = Matrix Spike

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Total metals includes Aluminum and Iron only

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

The TDS results for rinsate blank samples RB01T-MIX13-D00, RB02T-MIX13-D10, and RB03T-MIX13-D50 yielded concentrations that were higher than what would be expected for rinsate blank samples. Due to these high results, the laboratory project manager inspected the sample containers and observed that the samples were yellow in color. RB01T/D-MIX13-D00 is a sample of the laboratory reconstituted water used in some of their dilution tests (in place of Red River water). RB02T/D-MIX13-

D10 and RB03T/D-MIX13-D50 are mixes of spring 13 water and Red River water collected upstream of Spring 13. These mixtures were treated as if they were being used in the bioassay except that CEC did not add any fish to the water. Thus these are not QC samples and are not useful for qualifying date during validation.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample MIX39-D05N-D02.5 was inadvertently logged by the laboratory as MIX39-D05N-D0.25. The correct sample ID was recorded on the COC, the Form 1s in the data package were changed the correct ID.
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken 2 days after the samples were logged-in. The pH measurements were taken the day the samples were logged-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1 summarizes all samples qualified on the basis of holding time. An indeterminate bias direction was assigned to all qualifications, with a qualifier code of "HT".
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD MIX13-T05N-D02.5 (TOC) MIX13-T05N-D05 (Fluoride) MIX13-T05N-D10 (Chloride) MIX39-T05N-D02.5 (Sulfate) • LD MIX13-T05N-D02.5 (TOC) MIX13-T05N-D05 (Fluoride) MIX13-T05N-D10 (Chloride) MIX39-T05N-D02.5 (Sulfate)	No	All matrix spike recoveries were within criteria except for TOC and chloride. Table 3 summarizes the outlying recoveries and the resultant data qualifications. The matrix quality control results for the September 2004 Serial Dilution Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MIX13-D05N-D00 MIX13-D05N-D02.5 • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses were run on samples MIX13-D05N-D00 and MIX13-D05N-D02.5. For sample MIX13-D05N-D00, the serial dilution results were only applicable for 2 of the 13 analytes. For sample MIX13-D05N-D02.5, the serial dilution results were only applicable for 1 of the 11 analytes. Some of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. The nickel result was outside criteria for sample MIX13-D05N-D02.5, Table 4 summarizes the outlying result and resultant data qualification. The serial dilution results for the September 2004 Serial Dilution Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The cation/ anion balance could not be calculated since all of the constituents were not analyzed in this SDG.
Field QC • Field Duplicate • Rinsate Blank RB01T-MIX13-D00 RB01D-MIX13-D00 RB02T-MIX13-D10 RB02D-MIX13-D10 RB03T-MIX12-D50 RB03D-MIX12-D50	Yes	The rinsate blank detections will be assessed collectively with all other rinsate blank results to determine the need for qualification. The field QC results for the September 2004 Serial Dilution Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Holding Time Qualifications for Inorganics

Sample	Cond. (µmhos/cm)	pH (std units)
MIX13-T05N-D02.5	296 J	7.1 J
MIX13-T05N-D05	333 J	7.3 J
RB01T-MIX13-D00	256 J	7.4 J
RB02T-MIX13-D10	404 J	6.4 J
RB03T-MIX13-D50	985 J	4.5 J
MIX39-T05N-D10	371 J	6.9 J
MIX39-T05N-D02.5	277 J	7.3 J

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	1.8	1.8	1.8	1.8	1.495		MIX13-D05N-D00 MIX13-D05N-D02.5 MIX13-D05N-D05 MIX39-D05N-D02.5 MIX39-D05N-D10 RB01D-MIX13-D00 RB02D-MIX13-D10 RB03D-MIX13-D50	U CCB, MB-I
Beryllium	---	0.4	0.4	---	---		MIX13-D05N-D00 MIX39-D05N-D10 RB02D-MIX13-D10	U CCB-I
Cadmium	-0.1	---	---	---	---		MIX13-D05N-D00 RB01D-MIX13-D00	UJ CCB-L
Chromium	1.4	---	1.2	---	1.233		MIX13-D05N-D00 MIX13-D05N-D02.5 MIX13-D05N-D05 MIX39-D05N-D02.5 MIX39-D05N-D10 RB01D-MIX13-D00 RB02D-MIX13-D10 RB03D-MIX13-D50	U CCB, MB-I
Iron	60.4	45.3	51.6	---	46.37		MIX13-D05N-D00 MIX13-D05N-D02.5 MIX13-D05N-D05 MIX39-D05N-D02.5 MIX39-D05N-D10 RB01D-MIX13-D00	U MB, CCB-I
Molybdenum	0.8	0.6	0.6	0.6	0.723		MIX13-D05N-D05 MIX39-D05N-D02.5 MIX39-D05N-D10 RB01D-MIX13-D00 RB02D-MIX13-D10	U CCB, MB-I
Nickel	-0.6	-0.7	-0.6	-0.6	-0.541		RB01D-MIX13-D00	UJ CCB, MB-L

CCBx-Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Parent Sample Qualification
MIX13-T05N-D02.5				
TOC	136	N/A	75-125	J MS-H
MIX39-T05N-D10				
Chloride	26	N/A	75-125	J MS-L

Table 4
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	Sample Result (ug/L)	Serial Dilution Result (ug/L)	%D	Qualification
MIX13-D05N-D02.5				
Nickel	16.57	13.37	19.3	J DL-H

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT310 Sampling Events: September 2004 Serial Dilution Study

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike Date Completed: 10/26/04

Peer Reviewer: Stacey Coker Date Completed: 12/03/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics
SPRING13PUMP-T05N-GRW	SA	588492	SPRING13PUMP-T05N-GR	W	X	X
SPRING13PUMP-D05N-GRW	SA	588493	SPRING13PUMP-D05N-GR	W	X	X[2]
SPRING39PUMP-T05N-GRW	SA	588494	SPRING39PUMP-T05N-GR	W	X	X
SPRING39PUMP-D05N-GRW	SA	588495	SPRING39PUMP-D05N-GR	W	X	X[2]
SPRING39PUMP-T05D-GRW	FD	588496	SPRING39PUMP-T05D-GR	W	X	X
SPRING39PUMP-D05D-GRW	FD	588497	SPRING39PUMP-D05D-GR	W	X	X[2]
RRUSSPRING39-T05N-SFW	SA, MS, LD	588498	RRUSSPRING39T05N-SFW	W	X	X
RRUSSPRING39-D05N-SFW	SA, MS, LD	588499	RRUSSPRING39D05N-SFW	W	X	X[2]
RRUSSPRING13-T05N-SFW	SA	588500	RRUSSPRING13T05N-SFW	W	X	X
RRUSSPRING13-D05N-SFW	SA	588501	RRUSSPRING13D05N-SFW	W	X	X[2]

Matrix: W = Water MS = Matrix Spike

QC Type: SA = Sample LD = Laboratory Duplicate FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Analyzed for dissolved organic carbon (DOC) only.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	Samples RRUSSPRING13-T05N-SFW, RRUSSPRING13-D05N-SFW, RRUSSPRING39-T05N-SFW, and RRUSSPRING39-D05N-SFW were inadvertently marked on the COCs as RRUSSPRING13PUMP-T05N-SFW, RRUSSPRING13PUMP-D05N-SFW, RRUSSRPING39PUMP-T05N-SFW, and RRUSSPRING39PUMP-D05N-SFW. The laboratory was contacted and the samples were logged in with the correct IDs, no qualifications of data were necessary.
Holding Times	No	The laboratory re-analyzed sample RRUSSPRING13-T05N-SFW for all of the alkalinity analyses when it was discovered that the original values were not consistent with historical results. The re-analyses were accomplished 9 days outside on holding time. The alkalinity results for sample RRUSSPRING13-T05N-SFW were qualified as estimated (J HT-I).
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD RRUSSPRING39-T05N-SFW RRUSSPRING39-D05N-SFW • LD RRUSSPRING39-T05N-SFW RRUSSPRING39-D05N-SFW	Yes	All matrix spike recoveries were within criteria except the TOC result (161%) for sample RRUSSPRING39-T05N-SFW. Since the sample result was nondetect and the spike recovery had a high bias, no qualifications of data were necessary. The matrix quality control results for the September 2004 Serial Dilution Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RRUSSPRING39-T05N-SFW RRUSSPIRNG39-D05N-SFW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses were run on the matrix spikes of samples RRUSSPRING39-T05N-SFW and UURSSPRING35-D05N-SFW. For both samples, the serial dilution results were applicable for 21 of the 24 analytes. Some of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. The selenium result was outside criteria for sample RRUSSPRING39-T05N-SFW. The arsenic and selenium results were outside criteria for sample RRUSSPRING39-D05N-SFW. Table 2 summarizes the outlying results and resultant data qualifications. The serial dilution results for the September 2004 Serial Dilution Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within the acceptance range of 0.5 and 1.5.
Field QC • Field Duplicate SPRING39PUMP-T05N-SFW SPRING39PUMP-T05D-SFW SRPING39PUMP-D05N-SFW SRPING39PUMP-D05D-SFW • Rinsate Blank	Yes	All field duplicate results were within evaluation criteria, no qualifications of data were necessary. The field QC results for the September 2004 Serial Dilution Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the Serial Dilution Study.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	1.8	1.8	1.8	1.8	1.8	1.8	1.784	0.30	RRUSSPRING13-D05N-SFW RRUSSPRING13-T05N-SFW RRUSSPRING39-D05N-SFW RRUSSPRING39-T05N-SFW	U CCB, MB-I
Cadmium	-0.1	---	---	---	---	---	-0.107	0.10	RRUSSPRING13-D05N-SFW RRUSSPRING13-T05N-SFW RRUSSPRING39-D05N-SFW RRUSSPRING39-T05N-SFW	J/UJ CCV, MB-L
Molybdenum	0.8	0.6	0.6	0.6	0.7	0.7	0.643	0.40	RRUSSPRING13-D05N-SFW RRUSSPRING13-T05N-SFW RRUSSPRING39-D05N-SFW RRUSSPRING39-T05N-SFW	U CCB, MB-I

CCBx-Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 2
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	Sample Result (ug/L)	Serial Dilution Result (ug/L)	%D	Qualification
RRUSSPRING39-T05N-SFW				
Selenium	17.220	20.84	21.0	UJ DL-L
RRUSSPRING39-D05N-SFW				
Arsenic	18.73	20.82	11.2	UJ DL-L
Selenium	17.08	20.07	17.5	UJ DL-L

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT314

Sampling Events: September 2004 Serial Dilution Study

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike

Date Completed: 11/08/04

Peer Reviewer: Stacey Coker

Date Completed: 12/03/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals[2]	Inorganics
MIX13-T07N-D00	SA, MS, LD	589364		W	X	
MIX13-D07N-D00	SA, MS, LD	589365		W	X	
MIX13-T07N-D02.5	SA	589366		W	X	X
MIX13-D07N-D02.5	SA	589367		W	X	
MIX13-T07N-D05	SA	589368		W	X	X
MIX13-D07N-D05	SA	589369		W	X	
MIX39-T07N-D00	SA	589370		W	X	X
MIX39-D07N-D00	SA	589371		W	X	
MIX39-T07D-D00	FD	589372		W	X	
MIX39-D07D-D00	FD	589373		W	X	
MIX39-T07N-D20	SA	589374		W	X	X
MIX39-T07D-D20	FD	589375		W	X	X
MIX39-T07N-D10	SA	589376		W	X	X
MIX39-D07N-D10	SA	589377		W	X	
MIX39-T07N-D05	SA	589378		W	X	X[3]
MIX39-T07N-D02.5	FD	589379		W	X	X
MIX39-D07N-D02.5	SA	589380		W	X	
MIX13-T07D-D02.5	FD	589381		W		X (TOC)

Matrix: W = Water MS = Matrix Spike

QC Type: SA = Sample LD = Laboratory Duplicate FD = Field Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Total metals includes Aluminum and Iron only

[3]pH and conductivity only

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements were taken 2 days after the samples were logged-in. The pH measurements were taken the day the samples were logged-in. Table 1 summarizes the results that exceeded holding time and the resultant data qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD MIX13-T07N-D00 MIX13-D07N-D00 • LD MIX13-T07N-D00 MIX13-D07N-D00	Yes	All matrix spike recoveries were within criteria. Therefore, no qualifications of data were necessary. The matrix quality control results for the September 2004 Serial Dilution Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution MIX13-T07N-D00 MIX13-D07N-D00 • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses were run on samples MIX13-D07N-D00 and MIX13-D07N-D00. For sample MIX13-D07N-D00, the serial dilution results were applicable for both analytes reported. For sample MIX13-D07N-D00, the serial dilution results were applicable for 21 of the 24 analytes. Some of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. The selenium result was outside the criterion for sample MIX13-D07N-D00. Table 3 summarizes the outlying result and resultant data qualification. The serial dilution results for the September 2004 Serial Dilution Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The cation/ anion balance could not be calculated since all of the constituents were not analyzed in this SDG.
Field QC • Field Duplicate MIX39-T07D-D00 MIX39-D07D-D00 MIX39-T07D-D20 MIX13-T07D-D02.5 • Rinsate Blank	Yes	All field duplicate results were within evaluation criteria, no qualifications of data were necessary. The field QC results for the September 2004 Serial Dilution Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the Serial Dilution Study.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Holding Time Qualifications for Inorganics

Sample	Cond. (µmhos/cm)	pH (std units)
MIX13-T07N-D02.5	368 J	7.4 J
MIX13-T07N-D05	408 J	7.3 J
MIX39-T07N-D20	579 J	7.2 J
MIX39-T07D-D20	577 J	7.2 J
MIX39-T07N-D10	440 J	7.2 J
MIX39-T07N-D05	368 J	7.4 J
MIX39-T07N-D02.5	331 J	7.5 J

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony (10/18/04)	1.5	1.3	1.3	1.4	1.011	0.30	MIX13-D07N-D02.5 MIX13-D07N-D05 MIX39-D07D-D00 MIX39-D07N-D00 MIX39-D07N-D02.5 MIX39-D07N-D10	U CCB, MB-I
Antimony 10/20/04	1.5	1.5	---	---	1.011	0.30	MIX13-D07N-D00	U CCB, MB-I
Arsenic 10/18/04	---	---	---	---	-0.129	0.10	MIX13-D07N-D02.5 MIX13-D07N-D05 MIX39-D07D-D00 MIX39-D07N-D00 MIX39-D07N-D02.5 MIX39-D07N-D10	J MB-L
Arsenic (10/20/04)	---	-0.1	---	---	-0.129	0.10	MIX13-D07N-D00	J CCB, MB-L

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Cadmium (10/20/04)	-0.3	-0.3	---	---	---	0.10	MIX 13-D01N-D00	UJ CCB-L
Chromium	-3.6	-3.6	-1.8	---	-2.327	1.1	MIX13-D07N-D02.5 MIX13-D07N-D05 MIX39-D07D-D00 MIX39-D07N-D00 MIX39-D07N-D02.5 MIX39-D07N-D10 MIX13-D07N-D00	UJ CCB, MB-L
Copper (10/18/04)	-1.5	-1.5	-1.4	-1.5	-0.701	0.30	MIX13-D07N-D02.5 MIX13-D07N-D05 MIX39-D07N-D10	J CCB-L
							MIX39-D07D-D00 MIX39-D07N-D00 MIX39-D07N-D02.5	J CCB, MB-L
Copper (10/20/04)	-1.7	-1.7	---	---	-0.701	0.30	MIX13-D07N-D00	J CCB, MB-L
Iron	-95.3	-82.8	---	---	-51.75	35.5	MIX13-D07N-D02.5 MIX13-D07N-D05 MIX39-D07D-D00 MIX39-D07N-D00 MIX39-D07N-D02.5 MIX39-D07N-D10 MIX13-D07N-D00	UJ CCB, MB-L
Selenium (10/18/04)	-0.3	---	---	---	-0.419	0.30	MIX13-D07N-D02.5 MIX13-D07N-D05 MIX39-D07D-D00 MIX39-D07N-D00 MIX39-D07N-D02.5 MIX39-D07N-D10	UJ MB-L
Silver (10/18/04)	-0.1	-0.1	-0.1	-0.1	-0.129	0.10	MIX13-D07N-D02.5 MIX13-D07N-D05 MIX39-D07D-D00 MIX39-D07N-D00 MIX39-D07N-D02.5 MIX39-D07N-D10	UJ CCB, MB-L
Silver (10/20/04)	-0.2	-0.2	---	---	-0.129	0.10	MIX13-D07N-D00	UJ CCB, MB-L
Vanadium (10/20/04)	-0.1	--	---	---	---	0.10	MIX13-D07N-D00	UJ CCB-L

CCBx-Continuing Calibration Blank RL= Reporting Limit IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 3
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	Sample Result (ug/L)	Serial Dilution Result (ug/L)	%D	Qualification
MIX13-D07N-D00				
Selenium	16.76	20.06	19.7	J DL-L

%D= Percent difference

MOLYCORP RI/FS
DATA VALIDATION REPORT
FOR THE
SEPTEMBER 2004 BENTHIC
SURVEY STUDY,

A COMPONENT OF THE
SUPPLEMENTAL SPRING 13 AND
SPRING 39 SAMPLING EVENT

Prepared for

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Dilution Schemes/Non-Detects With Elevated RLs 3-1
3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 3-1
3.2.3 Non-Valid Matrix Spikes 3-2
3.2.4 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Summary/Assessment of Matrix QC 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.1.1 Surface Water Matrix Spike Results 4-1
4.1.2 Sediment Matrix Spike Results 4-2
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-4
4.3 Serial Dilution Results 4-5
4.3.1 Surface Water Serial Dilution Results 4-5
4.3.2 Sediment Serial Dilution Results 4-6

Section 5 Collective Summary/Assessment of Field QC 5-1

5.1 Field Duplicate Results 5-1
5.2 Rinsate Blank Results 5-2
5.2.1 Surface Water Rinsate Blank Results 5-2
5.2.2 Sediment Rinsate Blank Results 5-3

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-1
6.4 Representativeness 6-2
6.5 Comparability 6-2
6.6 Sensitivity 6-2

TABLE OF CONTENTS

List of Tables

Table 1-1	List of Field Samples Submitted for Analysis
Table 4-1	Field Samples Designated for Matrix QC Analysis
Table 4-2	Inorganics Matrix Spike Results for Surface Water
Table 4-3	Inorganics Matrix Spike Results for Sediment
Table 4-4	Inorganics Laboratory Duplicate Results
Table 4-5	Inorganic Laboratory Duplicate Exceedances
Table 4-6	ICP Serial Dilution Samples
Table 4-7	ICP Serial Dilution Results for Surface Water
Table 5-1	Summary of Field Duplicate Samples Collected
Table 5-2	Summary of Field Duplicate Sample Exceedances
Table 5-3	Summary of Rinsate Blank Results for Surface Water

List of Attachments

Attachment 1.1	Data Review Summary for Data Package WAT302
Attachment 1.2	Data Review Summary for Data Package WAT304
Attachment 1.3	Data Review Summary for Data Package WAT305
Attachment 1.4	Data Review Summary for Data Package WAT306
Attachment 1.5	Data Review Summary for Data Package SOL110
Attachment 1.6	Data Review Summary for Data Package SOL111

This Data Validation Report (DVR) contains the results of the data validation conducted for 25 surface water samples, 24 sediment samples, and associated quality control (QC) samples collected during the Benthic Survey Study. The Benthic Survey Study was one component of the Supplemental Spring 13 and 39 Sampling Event conducted as part of the Molycorp RI/FS. The following two matrices were sampled for the Benthic Survey Study:

- Surface Water
- Sediment

The surface water and sediment samples were sent to STL Burlington (STL-B), in Colchester, Vermont for metals and inorganic parameters analysis. In total, five data packages were reported for the Benthic Survey study. The results for the Benthic Survey Surface Water event were reported in data packages WAT302, WAT304, and WAT305. The results for the Benthic Survey Sediment event were reported in data packages SOL110 and SOL111.

- All surface water samples were analyzed for total metals (Aluminum and Iron only), dissolved metals, and inorganic parameters (aqueous media);
- All sediment samples were analyzed for total metals and inorganic parameters (solid media) as defined in the RI/FS QAPP.

This data validation report describes the data validation process used and presents the data review results for the surface water, sediment and associated QC samples submitted to STL for chemical analysis. The field sample IDs and associated data package numbers are provided in Table 1-1.

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
Surface Water: total metals, dissolved metals and inorganic parameters (aqueous media)		
WAT302	TR-10-T01N-SFW	
	TR-10-D01N-SFW	
	TR-11-T01N-SFW	
	TR-11-D01N-SFW	
	TR-1-T01N-SFW	
	TR-1-D01N-SFW	
	TR-1-T01D-SFW	FD to sample TR-1-T01N-SFW
	TR-1-D01D-SFW	FD to sample TR-1-D01N-SFW
	TR-3-T01N-SFW	
	TR-3-D01N-SFW	
	TR-12-T01N-SFW	
	TR-12-D01N-SFW	
	TR-2-T01N-SFW	MS, LD, SD
	TR-2-D01N-SFW	MS, LD, SD

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
WAT304	TR-6-T01N-SFW	
	TR-6-D01N-SFW	
	TR-7-T01N-SFW	
	TR-7-D01N-SFW	
	TR-13-T01N-SFW	MS, LD, SD
	TR-13-D01N-SFW	MS, LD, SD
	TR-15-T01N-SFW	
	TR-15-D01N-SFW	
	TR-15-T01D-SFW	FD to sample TR-15-T01N-SFW
	TR-15-D01D-SFW	FD to sample TR-15-D01N-SFW
	TR-5-T01N-SFW	
	TR-5-D01N-SFW	
	TR-4-T01N-SFW	
	TR-4-D01N-SFW	
	TR-8-T01N-SFW	
	TR-8-D01N-SFW	
	TR-19-T01N-SFW	
	TR-19-D01N-SFW	
	TR-18-T01N-SFW	
	TR-18-D01N-SFW	
WAT305	TR-16-T01N-SFW	SD
	TR-16-D01N-SFW	SD
	TR-9-T01N-SFW	
	TR-9-D01N-SFW	
	TR-14-T01N-SFW	
	TR-14-D01N-SFW	
	TR-17-T01N-SFW	
	TR-17-D01N-SFW	
	TR-20-T01N-SFW	
	TR-20-D01N-SFW	
	TR-101-T01N-SFW	
	TR-101-D01N-SFW	
	TR-102-T01N-SFW	
	TR-102-D01N-SFW	
	TR-103-T01N-SFW	
	TR-103-D01N-SFW	
	TR-104-D01N-SFW	

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
Sediment total metals, dissolved metals and inorganic parameters (aqueous media)		
SOL110	TR-1N-T01N-SED	
	TR-2N-T01N-SED	
	TR-3N-T01N-SED	
	TR-10N-T01N-SED	
	TR-11N-T01N-SED	
	TR-12N-T01N-SED	MS, LD, SD
SOL111	TR-5N-T01D-SED	
	TR-8N-T01N-SED	
	TR-6N-T01N-SED	
	TR-7N-T01N-SED	
	TR-13N-T01N-SED	MS, LD, SD
	TR-14N-T01N-SED	
	TR-17N-T01N-SED	
	TR-15N-T01N-SED	
	TR-5N-T01N-SED	
	TR-16N-T01N-SED	
	TR-4N-T01N-SED	
	TR-18N-T01N-SED	
	TR-19N-T01N-SED	
	TR-20N-T01N-SED	
	TR-101N-T01N-SED	
	TR-102N-T01N-SED	
	TR-103N-T01N-SED	
	TR-104N-T01N-SED	
	TR-9N-T01N-SED	

MS = Matrix Spike LD = Laboratory Duplicate SD = Serial Dilution FD = Field Duplicate

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, matrix spike recoveries, laboratory duplicate or spike duplicate analysis, post-digestion spike recoveries, ICP serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates and rinsate blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1 and is as follows: if no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used; if no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used; if no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

Section 3.0 includes the data review narratives for each of the data packages. In all cases of professional judgment exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data review narrative.

The site-specific matrix spike (MS) results, laboratory duplicate results, serial dilution results, blanks (rinsate), field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect

was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (MS/MSD results, laboratory duplicate results, and serial dilution results) and associated sample qualification. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 7.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for the data packages included in this event. In order to attain the frequency requirements for laboratory performance reviews, two data package (WAT302 and SOL111) were evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identified whether any findings globally affect all relevant samples analyzed for the Benthic Survey study. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

3.2.1 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the Benthic Survey Study.

During the project, the need to analyze all surface water samples without dilution, regardless of pH, was identified. As such, surface water samples were generally analyzed without dilution, unless dilution was necessary based on analyte concentrations present in the sample.

3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly

variable pH range of the water samples and the associated carbonate species equilibria were found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

3.2.3 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked analytes. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.4 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in section 3.0. STL data package WAT302 and SOL110 were used to evaluate laboratory performance criteria. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated for all packages for this event included:

- Continuing Calibration Verification (CCV) results;
- Initial Calibration Verification (ICV) results; and
- Laboratory Control Sample (LCS) recovery results.

The site-specific matrix spike (MS) results, laboratory duplicate (LD) results, and serial dilution results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analysis, LD analyses, and the serial dilution results for the samples collected during the sampling event.

The Table 4-1 illustrates the site-samples that were used to prepare matrix spike samples. As two matrix spikes were prepared and analyzed for metals, dissolved metals and inorganic parameters for 25 surface water field sample sites (excluding field duplicate samples), and two matrix spikes were prepared and analyzed for metals and inorganic parameters for 24 sediment field sample sites (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Table 4-1
Field Samples Designated for Matrix QC Analysis

Benthic Survey Event	Sample ID	Matrix	Data Package	Analyses
Surface Water	TR-2-T01N-SFW	Surface Water	WAT302	Total Metals (Aluminum and Iron) and Inorganic Parameters
	TR-2-D01N-SFW	Surface Water	WAT302	Dissolved Metals
	TR-13-T01N-SFW	Surface Water	WAT304	Total Metals (Aluminum and Iron) and Inorganic Parameters
	TR-13-D01N-SFW	Surface Water	WAT304	Dissolved Metals
Sediment	TR-12N-T01N-SED	Sediment	SOL110	Metals and Inorganic Parameters
	TR-13N-T01N-SED	Sediment	SOL111	Metals and Inorganic Parameters

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

A number of spike recoveries were outside of the QC acceptance limits of 75%-125%. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the magnitude of outages, and the number of valid spike recoveries relative to the size of the sample set.

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the MS exceedances were caused by the sample matrix, a bias in the analytical system, or a combination of both. Recoveries for all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

4.1.1 Surface Water Matrix Spike Results

Table 4-2 summarizes the surface water results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Table 4-2
Inorganics Matrix Spike Results for Surface Water

Analyte	Total				Dissolved				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Aluminum	2	0	0		2	0	0	110.0	None
Antimony	N/A	---	---	---	2	0	0	97.6	None
Arsenic	N/A	---	---	---	2	0	0	94.0	None
Barium	N/A	---	---	---	2	0	0	101.7	None
Beryllium	N/A	---	---	---	2	0	0	105.3	None
Boron	N/A	---	---	---	2	0	0	103.7	None
Cadmium	N/A	---	---	---	2	0	0	94.9	None
Chromium	N/A	---	---	---	2	0	0	102.8	None
Cobalt	N/A	---	---	---	2	0	0	100.9	None
Copper	N/A	---	---	---	2	0	0	104.8	None
Iron	2	0	0	116.2	2	0	0	106.7	None
Lead	N/A	---	---	---	2	0	0	104.0	None
Manganese	N/A	---	---	---	2	0	0	102.8	None
Nickel	N/A	---	---	---	2	0	0	106.0	None
Mercury	N/A	---	---	---	2	0	0	99.1	None
Selenium	N/A	---	---	---	2	0	0	81.1	None
Molybdenum	N/A	---	---	---	2	0	0	104.5	None
Silver	N/A	---	---	---	2	0	0	110.7	None
Thallium	N/A	---	---	---	2	0	0	105.6	None
Vanadium	N/A	---	---	---	2	0	0	102.6	None
Zinc	N/A	---	---	---	2	0	0	102.6	None
Cyanide	2	0	0	101.8	NA	NA	NA	NA	None
Chloride	2	0	0	111.5	NA	NA	NA	NA	None
Total Alkalinity	2	0	0	118.0	NA	NA	NA	NA	None
Fluoride	2	0	0	95.5	NA	NA	NA	NA	None
Nitrate/ Nitrite	2	0	0	100.0	NA	NA	NA	NA	None
Nitrite	2	0	0	110.0	NA	NA	NA	NA	None
Orthophosphate	2	0	0	97.5	NA	NA	NA	NA	None
Phosphorous	2	0	0	103.0	NA	NA	NA	NA	None
Sulfate	2	1	0	96.0	NA	NA	NA	NA	None
TOC	2	0	0	107.0	NA	NA	NA	NA	None

All surface water sample matrix spike recoveries were within limits. No qualification of data were necessary.

4.1.2 Sediment Matrix Spike Results

Table 4-3 summarizes the surface water results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Table 4-3
Inorganics Matrix Spike Results for Sediment

Analyte	Total				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Aluminum	0	N/A	N/A	N/A	None, sample concentration was greater than 4X the spike level
Antimony	2	**2**	0	52.6	Qualify all sediment sulfate results as estimated (J/UJ MS-L)
Arsenic	2	**1**	**1**	93.15	Qualify all sediment sulfate results as estimated (J/UJ MS-I)
Barium	2	**1**	0	79.25	Qualify parent result as estimated (J MS-L)
Beryllium	2	0	0	104.2	None
Boron	2	0	0	91.9	None
Cadmium	2	0	0	100.0	None
Chromium	2	0	0	106.0	None
Cobalt	2	0	0	98.8	None
Copper	2	0	**1**	115.4	Qualify parent result as estimated (J MS-H)
Iron	0	N/A	N/A	N/A	None, sample concentration was greater than 4X the spike level
Lead	0	N/A	N/A	N/A	None, sample concentration was greater than 4X the spike level
Manganese	0	N/A	N/A	N/A	None, sample concentration was greater than 4X the spike level
Nickel	2	0	0	100.0	None
Mercury	2	0	0	103.9	None
Selenium	2	0	0	91.7	None
Molybdenum	2	0	1	120.8	Qualify parent result as estimated (J MS-H)
Silver	2	0	0	100.9	None
Thallium	2	0	0	102.3	None
Vanadium	2	0	0	100.9	None
Zinc	2	**1**	**1**	111.8	None
Chloride	2	0	0	100.5	Qualify all sediment sulfate results as estimated (J/UJ MS-I)
Fluoride	2	0	0	108.0	None
Sulfate	1	**0**	**1**	137.0	Qualify parent result as estimated (J-MS-H)
TOC	2	0	0	97.5	None

All sediment results were qualified as estimated based on matrix spike recoveries for antimony, arsenic, and zinc because both of the valid matrix spike results were outside the acceptance limits. For barium, molybdenum, and copper, 50% of the matrix spike recoveries were outside the acceptance limits. Data qualification was not extended to all samples due to the limited size of the sample set (i.e., 24 samples) and because the average spike recovery was within acceptance limits. With such a small sample set, the number of QC samples is insufficient for discerning whether or not a generalized matrix effect exists. Therefore, only the parent samples were qualified as estimated for barium, molybdenum, and copper.

For sulfate, two site-specific samples were used to prepare the matrix spike sample for the sediment matrix. For the matrix spike performed on sample TR-12N-T01N-SED, the sulfate recovery was reported as 0%. Upon investigation, it was determined by the data reviewer and later confirmed by the laboratory that the MS sample was inadvertently not spiked for sulfate. Therefore, this matrix spike was not used to assess accuracy with respect to site-specific sample matrix. Therefore, only the parent sample (TR-13N-T01N-SED) was qualified based on the sulfate MS recovery.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Table 4-4 illustrates the site-samples that were used to prepare laboratory duplicate samples. As two laboratory duplicates were prepared and analyzed for metals, dissolved metals and inorganic parameters for 25 surface water field sample sites (excluding field duplicate samples), and two laboratory duplicates were prepared and analyzed for metals and inorganic parameters for 24 sediment field sample sites (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied.

Table 4-4
Inorganics Laboratory Duplicate Results

Benthic Survey Event	Sample ID	Matrix	Data Package	Analyses
Surface water	TR-2-T01N-SFW	Surface Water	WAT302	Total Metals (Aluminum and Iron) and Inorganic Parameters
	TR-2-D01N-SFW	Surface Water	WAT302	Dissolved Metals
	TR-13-T01N-SFW	Surface Water	WAT304	Total Metals (Aluminum and Iron) and Inorganic Parameters
	TR-13-D01N-SFW	Surface Water	WAT304	Dissolved Metals
Sediment	TR-12-T01N-SED	Sediment	SOL110	Metals and Inorganic Parameters
	TR-13N-T01N-SED	Sediment	SOL111	Metals and Inorganic Parameters

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The relative percent differences (RPD) criterion ≤20% (≤35% for sediments) was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL (less than two times the greater RL for sediment). For metals data, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL, which was considered to be too low to be used as the baseline for these concentration dependent evaluations.

The RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within the QAPP acceptance limits with the exception listed in the table below.

Table 4-5
Inorganic Laboratory Duplicate Exceedances

Benthic Survey Event	Analyte	Sample ID	Criterion	Criterion Exceedance	Action
Sediment	Lead	TR-13N-T01N-SED	RPD<35%	74.8%	J D-I for parent sample only.

For lead for the sediment matrix, 50% of the laboratory duplicate results were outside the evaluation criteria. Data qualification was not extended to all samples due to the limited size of the sample set (i.e. 24 samples). With such a small sample set, the number of QC samples is insufficient for discerning whether or not a generalized matrix effect exists.

4.3 SERIAL DILUTION RESULTS

Serial dilution tests involve the analysis of a sample and a five-fold dilution of the same sample. When analyte concentrations are sufficiently high (i.e., greater that 50x the instrument detection limit [IDL]), the original result and diluted sample result are expected to be fairly comparable. If the results are not comparable, it is generally assumed that there are matrix interferences that are resulting in the suppression or elevation of the signal for one or more analytes.

The original and diluted sample results are compared by a percent difference (%D). When %Ds ≤10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate that the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result. As illustrated by the Table 4-6 below, serial dilution tests were conduced on five surface water samples representing the surface water matrix and two sediment samples representing the sediment matrix.

Table 4-6
ICP Serial Dilution Samples

Benthic Survey Event	Sample ID	Matrix	Data Package	Analyses
Surface Water	TR-2-D01N-SFW	Surface Water	WAT302	Dissolved Metals
	TR-13-T01N-SFW	Surface Water	WAT304	Total Metals (Aluminum and Iron)
	TR-13-D01N-SFW	Surface Water	WAT304	Dissolved Metals
	TR-16-T01N-SFW	Surface Water	WAT305	Total Metals (Aluminum and Iron)
	TR-16-D01N-SFW	Surface Water	WAT305	Dissolved Metals
Sediment	TR-12-T01N-SED	Sediment	SOL110	Total Metals
	TR-13N-T01N-SED	Sediment	SOL111	Total Metals

A number of %Ds between the original sample results and the result obtained from a sample diluted 1:5 were >10%. In general, qualification was generally limited to the parent samples if less than a quarter of the valid serial dilution results for a given metal were outside of the acceptance range. Conversely, qualification was generally considered necessary if more than a quarter of the results for a metal were outside the acceptance range. However, factors such as the number of valid measurements relative to the size of the sample set and the magnitude of outages were also taken into consideration.

4.3.1 Surface Water Serial Dilution Results

Table 4-7 summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued for all surface water results.

Table 4-7
ICP Serial Dilution Results for Surface Water

Analyte	Total Metals					Dissolved Metals					Action
	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		
				Low	High				Low	High	
Aluminum	1	0	5.2	0	0	2	0	4.1	0	0	None
Antimony	N/A	N/A	N/A	N/A	N/A	2	0	5.7	0	0	None
Arsenic	N/A	N/A	N/A	N/A	N/A	2	0	4.8	0	0	None
Barium	N/A	N/A	N/A	N/A	N/A	2	0	2.4	0	0	None
Beryllium	N/A	N/A	N/A	N/A	N/A	2	0	2.4	0	0	None
Boron	N/A	N/A	N/A	N/A	N/A	2	0	4.0	0	0	None
Cadmium	N/A	N/A	N/A	N/A	N/A	2	**1**	8.3	**1**	0	J DL-L for parent sample
Calcium	N/A	N/A	N/A	N/A	N/A	3	0	1.7	0	0	None
Chromium	N/A	N/A	N/A	N/A	N/A	2	**1**	6.2	**1**	0	J DL-L for parent sample
Cobalt	N/A	N/A	N/A	N/A	N/A	2	0	2.5	0	0	None
Copper	N/A	N/A	N/A	N/A	N/A	2	0	2.2	0	0	None
Iron	1	**1**	15.8	0	**1**	1	0	2.2	0	0	J/UJ DL-H for all detectable total iron results.
Lead	N/A	N/A	N/A	N/A	N/A	2	0	2.5	0	0	None
Magnesium	N/A	N/A	N/A	N/A	N/A	1	0	5.0	0	0	None
Manganese	N/A	N/A	N/A	N/A	N/A	3	0	1.8	0	0	None
Nickel	N/A	N/A	N/A	N/A	N/A	2	0	2.8	0	0	None
Selenium	N/A	N/A	N/A	N/A	N/A	2	**2**	15.5	**2**	0	J/UJ DL-L for all dissolved selenium results.
Molybdenum	N/A	N/A	N/A	N/A	N/A	2	0	7.0	0	0	None
Silver	N/A	N/A	N/A	N/A	N/A	2	0	1.7	0	0	None
Potassium	N/A	N/A	N/A	N/A	N/A	0		---			None
Thallium	N/A	N/A	N/A	N/A	N/A	2	0	3.9	0	0	None
Vanadium	N/A	N/A	N/A	N/A	N/A	2	0	0.9	0	0	None
Sodium	N/A	N/A	N/A	N/A	N/A	0		---			None
Zinc	N/A	N/A	N/A	N/A	N/A	2	0	3.9	0	0	None

For selenium and iron, all of the valid serial dilution results, as well as average differences, were outside QC acceptance criterion. Qualification was extended to all surface water selenium and iron results. Fifty percent of the dissolved cadmium and dissolved chromium serial dilution results were outside the acceptance criterion. Because the average percent differences were within the acceptance criterion, qualification was limited to the parent samples for dissolved chromium and dissolved cadmium.

4.3.2 Sediment Serial Dilution Results

For sediment data, a serial dilution analysis was performed samples TR-12N-T01N-SED and TR-13N-T01N-SED. All serial dilution analyses were within QC acceptable limits, therefore, no qualification was performed.

The site-specific rinsate blanks and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. Field duplicate agreement was assessed to determine the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. The following sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

Table 5-1 presents the field duplicates collected for this event. As two field duplicates were prepared and analyzed for metals, dissolved metals and inorganic parameters for 25 surface water field sample sites (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied for surface water.

Only one field duplicate was prepared and analyzed for metals and inorganic parameters for 24 sediment field sample sites (excluding field duplicate samples), this was due to the limited amount of sample volume available.

Table 5-1
Summary of Field Duplicate Samples Collected

Benthic Survey Event	Sample ID	Matrix	Data Package	Analyses
Surface Water	TR-1-T01D-SFW	Surface Water	WAT302	Total Metals (Aluminum and Iron) and Inorganic Parameters
	TR-1-D01D-SFW	Surface Water	WAT302	Dissolved Metals
	TR-15-T01D-SFW	Surface Water	WAT304	Total Metals (Aluminum and Iron) and Inorganic Parameters
	TR-15-D01D-SFW	Surface Water	WAT304	Dissolved Metals
Sediment	TR-5N-T01D-SED	Sediment	SOL111	Metals and Inorganic Parameters

5.1 FIELD DUPLICATE RESULTS

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤30% (≤50% for sediments) was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For field duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than two times the greater RL (<3.5xRL for sediments). For metals data, the CRDL is used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL and the IDL, which was considered to be too low to be used as the baseline for these concentration dependent evaluations. With three exceptions, the applicable evaluation criterion was met. The exception and the resultant data qualifiers are summarized in the table below.

Table 5-2
Summary of Field Duplicate Sample Exceedances

Benthic Survey Event	Analyte	Sample ID	Criterion	Criterion Exceedance	Action
Surface Water	Bicarbonate Alkalinity	TR-15-T01N-SFW/ TR-15-T01D-SFW	RPD<30%	RPD= 66.7%	J FD-I for parent sample and duplicate
Surface Water	Total Alkalinity	TR-15-T01N-SFW/ TR-15-T01D-SFW	RPD<30%	RPD= 66.7%	J FD-I for parent sample and duplicate

Since the cation/anion balance was also outside the acceptance criterion for the duplicate sample TR-15-T01D-SFW, the outlying field duplicate was considered to be a sample specific issue and not applicable for the entire data set, qualification was limited to the field duplicate pairs TR-15-T01N-SFW/ TR-15-T01D-SFW.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. The rinsate blanks for the surface water event were given field IDs of RB01T/RB01D-SFW and RB02T/RB02D-SFW. The rinsate blanks for the sediment event were given field IDs of RB01T-SED, RB02T-SED, RB03T-SED, RB04T-SED, RB05T-SED and RB06T-SED. As two rinsate blanks were prepared and analyzed for total metals (aluminum and iron), dissolved metals and inorganic parameters for 25 surface water field sampling sites and six rinsate blanks were prepared and analyzed for metals and inorganic parameters for 24 sediment field sampling sites, the QAPP frequency for rinsate blank QC samples (5%) was satisfied.

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to aqueous sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result or biasing the average high by using the reporting limit.

5.2.1 Surface Water Rinsate Blank Results

Table 5-3 summarizes the detected rinsate blank results for the surface water event.

Table 5-3
Summary of Rinsate Blank Results for Surface Water

Analyte	Sample ID	Conc.	RL	Frequency of Detection	Average RB Concentration	Range for Field Samples	Number of Samples Qualified	Action
Inorganic Parameters (mg/L)								
Bicarbonate Alkalinity	RB01T-SFW	3.0	1.0	2 of 2	2.95	62.3 to 141	0	U RB-I for all sample results ≤14.8mg/L[1]
	RB02T-SFW	2.9						
Total Alkalinity	RB01T-SFW	3.0	1.0	2 of 2	2.95	62.3 to 141	0	U RB-I for all sample results ≤14.8mg/L[1]
	RB02T-SFW	2.9						
Nitrate/ Nitrite	RB01T-SFW	0.011	0.01	2 of 2	0.015	0.25 to 0.47	0	U RB-I for all sample results ≤0.075 mg/L[1]
	RB02T-SFW	0.019						
Total Dissolved Solids	RB02T-SFW	8.0	5.0	1 of 2	5.25	168 to 208	0	U RB-I for all sample results ≤26.3 mg/L[1]

In calculating the average rinsate blank concentration, one half of the RL was used for nondetect results.

[1] No qualification issued because all sample concentrations were greater than the qualification threshold.

No qualifications of data were necessary due to rinsate blank contamination. The rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and at relatively low levels.

5.2.2 Sediment Rinsate Blank Results

All sediment rinsate blank results were nondetect. Therefore, no qualifications of data were necessary.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank contamination. Some sample results were qualified as estimated on the basis of the LCS or MS results or holding time exceedances. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives. A general overall assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

For the surface water event, 99% of the field duplicate and laboratory results satisfied the applicable criteria. For the sediment event, 99% of both the field duplicate and laboratory results satisfied the applicable criteria. As such, the overall level of precision demonstrated is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery for LCS and MS samples.

All of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP, which is considered to be indicative of acceptable overall accuracy with respect to the analytical system.

The MS recoveries suggested that the overall accuracy attained with respect to the site-specific sample matrices are satisfactory as 100% of the MS recoveries for the surface waters and 74% of the MS recoveries for the sediments were within the QAPP acceptance range of 75-125%. Sample results were qualified accordingly as estimated due to low or high matrix spike recoveries.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results for the 52 samples analyzed (49 field samples and 3 field duplicates) are considered usable as qualified for meeting project objective. As such, the completeness for the samples analyzed is 100%, which satisfies the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the surface water samples. The close agreement between the field duplicate results is considered to indicate that the samples collected are adequately representative of the medium sampled. Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. As noted in Section 6.1, the laboratory duplicate results satisfied the precision evaluation indicating that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

All RLs obtained, met the QAPP specified RL requirements for aqueous media for which there was screening level criteria provided in the QAPP or the Baseline Ecological Risk Assessment to which RLs for nondetect analytes could be compared.

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the Benthic Survey Study.

During the project, the need to analyze all surface water samples without dilution, regardless of pH, was identified. As such, surface water samples were generally analyzed without dilution, unless dilution was necessary based on analyte concentrations present in the sample.

Attachments

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT302 Sampling Events: Benthic Survey Study

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **Yes**

Data Reviewer: Jennifer Winnike Date Completed: 12/02/04

Peer Reviewer: Stacey Coker Date Completed: 12/02/02

The table below summarizes the results presented in this data package.

Field ID	QC Type[1]	Lab ID	CLP Form Field ID Abbreviation	Analyses		
				Matrix	Metals	Inorganics
TR-10-T01N-SFW	SA	588008		W	X[2]	X
TR-10-D01N-SFW	SA	588009		W	X	
TR-11-T01N-SFW	SA	588010		W	X[2]	X
TR-11-D01N-SFW	SA	588011		W	X	
TR-1-T01N-SFW	SA	588012		W	X[2]	X
TR-1-D01N-SFW	SA	588013		W	X	
TR-1-T01D-SFW	FD	588014		W	X[2]	X
TR-1-D01D-SFW	FD	588015		W	X	
TR-3-T01N-SFW	SA	588016		W	X[2]	X
TR-3-D01N-SFW	SA	588017		W	X	
TR-12-T01N-SFW	SA	588018		W	X[2]	X
TR-12-D01N-SFW	SA	588019		W	X	
TR-2-T01N-SFW	SA, MS, MSD, LD	588020		W	X[2]	X
TR-2-D01N-SFW	SA, MS, MSD, LD	588021		W	X	

Matrix: W = Water FD = Field Duplicate

QC Type: SA = Sample MS = Matrix Spike LD = Laboratory Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Total metals includes Aluminum and Iron only.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

During the metals analysis, the laboratory inadvertently quantitated molybdenum results with the wrong isotope (i.e., an method detection limit was not determined for the isotope). The problem was discovered and the laboratory re-issued the molybdenum results quantitated using the correct isotope.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	Mercury was requested for these samples after the original submittal was provided by the laboratory. Mercury was reported in the addendum WAT302Hg.
Holding Times	Yes	
Method Blanks	No	Chloride was detected in the method blank run on 09/29/04. Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD TR-2-T01N-SFW TR-2-D01N-SFW • LD TR-2-T01N-SFW TR-2-D01N-SFW	Yes	All matrix QC results were within evaluation criteria. Therefore, no qualifications of data were necessary. The matrix quality control results for the September 2004 Benthic Survey Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution TR-2-T01N-SFW TR-2-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses were run on the matrix spikes of samples TR-2-T01N-SFW and TR-2-D01N-SFW. For sample TR-2-T01N-SFW, the serial dilution results were applicable for both analytes. For sample TR-2-D01N-SFW, the serial dilution results were only applicable for 21 of the 24 analytes. Some of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. Several serial dilution results were outside the review criterion for sample TR-2-D01N-SFW. Table 2 summarizes the outlying results and resultant data qualifications. The serial dilution results for the September 2004 Benthic Survey Study will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion, with the exception of sample TR-3-T/D01N-SFW, which reported a cation/ anion % difference of -16.74. Calcium and magnesium accounted for 92% of the cations and bicarbonate alkalinity and sulfate accounted for 97% of the anions. For sample TR-3-T01N-SFW, bicarbonate alkalinity and sulfate results were qualified as estimated and for sample TR-3-D01N-SFW the calcium and magnesium results were qualified as estimated. A bias code of indeterminate (J TvP-I) was given to the qualifications since it was uncertain whether the % difference was outside criteria based on the cations being low or the anions being high. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances.
Field QC • Field Duplicate TR-1-T01N-SFW TR-1-T01D-SFW TR-1-D01N-SFW TR-1-D01D-SFW • Rinsate Blank	Yes	All field duplicate results were within evaluation criteria, therefore, no qualifications of data were necessary. The field QC results for the September 2004 Benthic Survey Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the Benthic Survey Study.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	N/A	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken. The IDL initially reported for molybdenum was 0.00 µg/L. The laboratory was contacted for an explanation. Upon investigation, the laboratory discovered that the molybdenum results initially reported were quantitated based on the wrong isotope, which is why the IDL registered as 0.00 on the Form. The laboratory submitted revised reporting forms (i.e. Form 1s) with molybdenum results which were quantitated using the proper isotope. The revised data sheets were collated into the data package. A revised IDL summary form and EDD were also submitted.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. Acceptable performance is inferred from ongoing acceptable QC sample results.

Table 1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum	33.2	51.0	38.2	46.2	---	32.8	TR-10-D01N-SFW TR-11-D01N-SFW TR-12-D01N-SFW TR-1-D01N-SFW TR-1-D01D-SFW TR-2-D01N-SFW TR-3-D01N-SFW	U CCB-I
Antimony	0.9	0.9	0.8	0.9	---	0.3	TR-10-D01N-SFW TR-11-D01N-SFW TR-12-D01N-SFW TR-1-D01N-SFW TR-1-D01D-SFW TR-2-D01N-SFW TR-3-D01N-SFW	U CCB-I
Boron	9.3	7.0	9.0	5.6	7.863	3.0	TR-10-D01N-SFW TR-11-D01N-SFW TR-12-D01N-SFW TR-1-D01N-SFW TR-1-D01D-SFW TR-2-D01N-SFW TR-3-D01N-SFW	U CCB,MB-I
Cadmium	---	---	-0.1	---	---	0.1	TR-10-D01N-SFW TR-11-D01N-SFW TR-12-D01N-SFW TR-1-D01N-SFW TR-1-D01D-SFW TR-2-D01N-SFW TR-3-D01N-SFW	J/UJ CCB-L
Copper	---	---	---	---	0.831		TR-10-D01N-SFW TR-11-D01N-SFW TR-12-D01N-SFW TR-2-D01N-SFW TR-3-D01N-SFW	J MB-L
Molybdenum	0.8	0.7	0.7	0.7	0.438	0.4	TR-10-D01N-SFW TR-11-D01N-SFW TR-12-D01N-SFW TR-1-D01D-SFW TR-1-D01N-SFW TR-2-D01N-SFW TR-3-D01N-SFW	U CCB-I
Selenium	---	-0.2	-0.3	-0.3	---	0.2	TR-10-D01N-SFW TR-11-D01N-SFW TR-12-D01N-SFW TR-1-D01N-SFW TR-1-D01D-SFW TR-2-D01N-SFW TR-3-D01N-SFW	UJ CCB-L
Zinc	---	---	---	---	10.620	1.8	TR-10-D01N-SFW TR-11-D01N-SFW TR-12-D01N-SFW TR-1-D01N-SFW TR-1-D01D-SFW TR-2-D01N-SFW TR-3-D01N-SFW	U MB-I

CCBx-Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 2
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	MS Sample Result (ug/L)	Serial Dilution Result (ug/L)	%D	Qualification
TR-2-D01N-SFW				
Cadmium	19.0	21.2	11.2	J DL-L
Chromium	427	475	11.2	UJ DL-L
Selenium	15.6	18.4	18.0	UJ DL-L

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT304 Sampling Events: Benthic Survey Study

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike Date Completed: 10/20/04

Peer Reviewer: Stacey Coker Date Completed: 12/06/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Analyses		
				Matrix	Metals[2]	Inorganics
TR-6-T01N-SFW	SA	588373		W	X	X
TR-6-D01N-SFW	SA	588374		W	X	
TR-7-T01N-SFW	SA	588375		W	X	X
TR-7-D01N-SFW	SA	588376		W	X	
TR-13-T01N-SFW	SA, MS, MSD, LD	588377		W	X	X
TR-13-D01N-SFW	SA, MS, MSD, LD	588378		W	X	
TR-15-T01N-SFW	SA	588379		W	X	X
TR-15-D01N-SFW	SA	588380		W	X	
TR-15-T01D-SFW	FD	588381		W	X	X
TR-15-D01D-SFW	FD	588382		W	X	
TR-5-T01N-SFW	SA	588383		W	X	X
TR-5-D01N-SFW	SA	588384		W	X	
TR-4-T01N-SFW	SA	588385		W	X	X
TR-4-D01N-SFW	SA	588386		W	X	
TR-8-T01N-SFW	SA	588387		W	X	X
TR-8-D01N-SFW	SA	588388		W	X	
TR-19-T01N-SFW	SA	588389		W	X	X
TR-19-D01N-SFW	SA	588390		W	X	
TR-18-T01N-SFW	SA	588391		W	X	X
TR-18-D01N-SFW	SA	588392		W	X	

Matrix: W = Water FD = Field Duplicate

Type: SA = Sample MS = Matrix Spike LD = Laboratory Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Total metals includes Aluminum and Iron only

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	All samples in this SDG were analyzed 1-2 days outside of holding time for the nitrite and ortho-phosphate analyses. All of the nitrite and ortho-phosphate results in this SDG were qualified as estimated (**J HT-I**).
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD TR-13-T01N-SFW TR-13-D01N-SFW • LD TR-13-T01N-SFW TR-13-D01N-SFW	Yes	All Matrix QC was within evaluation criteria. Therefore, no qualifications of data were necessary. The matrix quality control results for the September 2004 Benthic Survey Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution TR-13-T01N-SFW TR-13-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses were run on the matrix spikes of samples TR-13-T01N-SFW and TR-13-D01N-SFW. For sample TR-13T01N-SFW, the serial dilution results were applicable for both analytes reported (aluminum and iron). For sample TR-13 -D01N-SFW, the serial dilution results were applicable for 21 of the 24 analytes. Some of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. The iron result was outside the criterion for sample TR-13-T01N-SFW. The selenium result was outside the criterion for sample TR-13-D01N-SFW. Table 2 summarizes the outlying results and resultant data qualification. The serial dilution results for the September 2004 Benthic Survey Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion, with the exception of two samples. For sample TR-15-T/D01D-SFW, a cation/ anion % difference of –20.26 was reported. For sample TR-8-T/D01N-SFW, a cation/ anion % of –20.10 was reported. For both samples, bicarbonate alkalinity and sulfate accounted for greater than 97% of the anion balance. The bicarbonate alkalinity and sulfate results for samples TR-15-T01N-SFW and TR-8-T01N-SFW were qualified as estimated with an indeterminate bias (**J TvP-I**). The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances.
Field QC • Field Duplicate TR-15-T01N-SFW TR-15-D01N-SFW TR-15-T01D-SFW TR-15-D01D-SFW • Rinsate Blank	No	All field duplicate results were within evaluation criteria except for bicarbonate alkalinity and total alkalinity for samples TR-15-T01N-SFW and TR-15-T01D-SFW. Table 3 summarizes the outlying results and the resultant data qualifications. The field QC results for the September 2004 Benthic Survey Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the Benthic Survey Study.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	1.1	1.0	1.0	---	---	0.650		TR-13-D01N-SFW TR-15-D01D-SFW TR-15-D01N-SFW TR-18-D01N-SFW TR-19-D01N-SFW TR-4-D01N-SFW TR-5-D01N-SFW TR-6-D01N-SFW TR-7-D01N-SFW TR-8-D01N-SFW	U CCB, MB-I
Arsenic	-0.3	-0.2	-0.2	---	---	-0.192		TR-13-D01N-SFW TR-15-D01D-SFW TR-15-D01N-SFW TR-18-D01N-SFW TR-19-D01N-SFW TR-4-D01N-SFW TR-5-D01N-SFW TR-6-D01N-SFW TR-7-D01N-SFW TR-8-D01N-SFW	UJ CCB, MB-L

Table 1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Copper	-1.4	-1.3	-1.3	---	---	-0.764		TR-13-D01N-SFW TR-15-D01D-SFW TR-15-D01N-SFW TR-18-D01N-SFW TR-19-D01N-SFW TR-4-D01N-SFW TR-6-D01N-SFW TR-7-D01N-SFW TR-8-D01N-SFW	J CCB, MB-L
Nickel	-1.7	-1.6	-1.7	---	---	-1.632		TR-15-D01D-SFW TR-15-D01N-SFW TR-18-D01N-SFW TR-19-D01N-SFW	J CCB, MB-L
								TR-13-D01N-SFW	J CCB-L
Molybdenum	1.5	---	---	---	---	0.845		TR-13-D01N-SFW TR-15-D01N-SFW TR-6-D01N-SFW TR-7-D01N-SFW	U CCB, MB-I
								TR-15-D01D-SFW TR-18-D01N-SFW TR-19-D01N-SFW TR-4-D01N-SFW TR-5-D01N-SFW TR-8-D01N-SFW	U MB-I
Vanadium	-0.1	-0.2	-0.1	---	---	-0.122		TR-13-D01N-SFW TR-15-D01D-SFW TR-15-D01N-SFW TR-18-D01N-SFW TR-19-D01N-SFW TR-4-D01N-SFW TR-5-D01N-SFW TR-6-D01N-SFW TR-7-D01N-SFW TR-8-D01N-SFW	UJ CCB, MB-L
Mercury	---	---	---	-0.1	-0.1	---		TR-13-D01N-SFW TR-15-D01D-SFW TR-15-D01N-SFW TR-18-D01N-SFW TR-19-D01N-SFW TR-4-D01N-SFW TR-5-D01N-SFW TR-6-D01N-SFW TR-7-D01N-SFW TR-8-D01N-SFW	UJ CCB-L

CCBx-Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 2
Serial Dilutions Resulting in Parent Sample Qualifications

Analyte	Sample Result (ug/L)	Serial Dilution Result (ug/L)	%D	Qualification
TR-13-T01N-SFW				
Selenium	2550	3028	15.8	J DL-H
TR-13-D01N-SFW				
Selenium	16.85	19.02	12.9	UJ DL-L

Table 3
Field Duplicates Concentrations and Data Qualifications

Analyte	TR-15-T01N-SFW	TR-15-T01D-SFW	Criteria Comment	Outside Criteria	RL	Action
Bicarbonate Alkalinity	69.9	140	RPD<30%	RPD=66.7%	1.0	J FD-I parent sample and duplicate
Total Alkalinity	69.9	140	RPD<30%	RPD=66.7%	1.0	J FD-I parent sample and duplicate

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT305 Sampling Events: Benthic Survey Study

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike Date Completed: 10/22/04

Peer Reviewer: Stacey Coker Date Completed: 10/27/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Analyses		
				Matrix	Metals[2]	Inorganics
TR-16-T01N-SFW	SA	588427		W	X	X
TR-16-D01N-SFW	SA	588428		W	X	
RB01T-SFW	RB	588429		W	X	X
RB01D-SFW	RB	588430		W	X	
TR-9-T01N-SFW	SA	588431		W	X	X
TR-9-D01N-SFW	SA	588432		W	X	
TR-14-T01N-SFW	SA	588433		W	X	X
TR-14-D01N-SFW	SA	588434		W	X	
TR-17-T01N-SFW	SA	588435		W	X	X
TR-17-D01N-SFW	SA	588436		W	X	
TR-20-T01N-SFW	SA	588437		W	X	X
TR-20-D01N-SFW	SA	588438		W	X	
RB02T-SFW	RB	588439		W	X	X
RB02D-SFW	RB	588440		W	X	
TR-101-T01N-SFW	SA	588441		W	X	X
TR-101-D01N-SFW	SA	588442		W	X	
TR-102-T01N-SFW	SA	588443		W	X	X
TR-102-D01N-SFW	SA	588444		W	X	
TR-103-T01N-SFW	SA	588445		W	X	X
TR-103-D01N-SFW	SA	588446		W	X	
TR-104-T01N-SFW	SA	588447		W	X	X
TR-104-D01N-SFW	SA	588448		W	X	

Matrix: W = Water

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Total metals includes Aluminum and Iron only

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

The TOC analysis of the Continuing Calibration (CCV) standard from the 09/29/04 analytical sequence yielded a percent recovery that exceeded the upper control limit. The recovery was 113%, slightly outside the acceptance range of 90-110%. Consequently, the TOC results for samples TR-16-T01N-SFW, TR-14-T01N-SFW, TR-17-T01N-SFW, and TR-20-T01N-SFW were qualified as estimated (**J CCV-H**).

The orthophosphate analyses of the calibration check standards from the 9/28/04 analytical sequence yielded percent recoveries of 89.2% and 89.4% which are slightly outside the acceptance range of 90-110%. All orthophosphate results in this data package were qualified as estimated (**J CCV-L**).

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Sample TR-14-SFW was collected on 9-25-04 as documented on the field COC and data sheet. However, the collection time was erroneously written on the laboratory COC as 9-24-04. The collection time was corrected in the database for this sample.
Holding Times	No	Several samples were analyzed 1-2 days outside of holding time for the nitrate and ortho-phosphate analyses. Table 1 summarizes the outlying results.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • LD	N/A	Matrix QC samples were not analyzed with this SDG. The matrix quality control results for the September 2004 Benthic Survey Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution TR-16-T01N-SFW TR-16-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses were run on samples TR-16-T01N-SFW and TR-16-D01N-SFW. For sample TR-16-T01N-SFW, the serial dilution results were not applicable for either analyte. For sample TR-16-D01N-SFW, the serial dilution results were only applicable for 2 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. No qualifications of data were necessary. The serial dilution results for the September 2004 Benthic Survey Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion, with the exception of three samples. For sample TR-16-T/D01N-SFW, a cation/ anion % difference of –17.37% was reported. Calcium and magnesium accounted for 92% of the cations and bicarbonate alkalinity and sulfate accounted for 97% of the anions. For sample TR-16-T01N-SFW, bicarbonate alkalinity and sulfate were qualified as estimated and for sample TR-16-D01N-SFW the calcium and magnesium results were qualified as estimated. A bias code of indeterminate (J TvP-I) was given to the qualifications since it was uncertain whether the % difference was outside criteria based on the cations being low or the anions being high. For samples RB01T/D-SFW and RB02T/D-SFW, balances of –50.38% and –50.01% were reported. As the concentrations were low enough that the reporting limits controlled the calculations, the cation/anion % difference was not representative of this comparison and therefore did not result in data qualification.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances
Field QC • Field Duplicate • Rinsate Blank RB01T-SFW RB01D-SFW RB02T-SFW RB02D-SFW	No	Field duplicates samples were not included in this SDG. The rinsate blank detections will be assessed collectively with all other rinsate blank results to determine the need for qualification. The field QC results for the September 2004 Benthic Survey Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the Benthic Survey Study.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Holding Time Qualifications for Inorganics

Sample	Nitrite –N (mg/L)	Ortho-Phosphate (mg/L)
TR-16-T01N-SFW	0.0050 UJ	0.010 UJ
RB01T-SFW	0.0050 UJ	0.010 UJ
TR-9-T01N-SFW	0.0050 UJ	0.010 UJ
TR-14-T01N-SFW	0.0050 UJ	0.010 UJ
TR-17-T01N-SFW	0.0050 UJ	0.010 UJ
TR-20-T01N-SFW	0.0050 UJ	0.010 UJ
TR-101-T01N-SFW	0.014 J	0.010 UJ

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	1.1	1.0	1.0	0.9	1.0	---	0.3	RB01D-SFW TR-101-D01N-SFW TR-102-D01N-SFW TR-103-D01N-SFW TR-104-D01N-SFW TR-14-D01N-SFW TR-16-D01N-SFW TR-17-D01N-SFW TR-20-D01N-SFW TR-9-D01N-SFW	U CCB, MB-I
Arsenic	-0.3	-0.2	-0.2	-0.2	-0.2	-0.203	0.1	RB01D-SFW RB02D-SFW TR-101-D01N-SFW TR-102-D01N-SFW TR-103-D01N-SFW TR-104-D01N-SFW TR-14-D01N-SFW TR-16-D01N-SFW TR-17-D01N-SFW TR-20-D01N-SFW TR-9-D01N-SFW	UJ CCB, MB-L
Copper	-1.4	-1.3	-1.3	-1.2	-1.3	-1.075	0.3	RB01D-SFW RB02D-SFW TR-101-D01N-SFW TR-102-D01N-SFW TR-103-D01N-SFW TR-104-D01N-SFW TR-14-D01N-SFW TR-16-D01N-SFW TR-17-D01N-SFW TR-20-D01N-SFW TR-9-D01N-SFW	J/ UJ CCB, MB-L
Nickel	-1.7	-1.6	-1.7	-1.7	-1.6	-1.527	0.3	RB01D-SFW RB02D-SFW TR-101-D01N-SFW TR-102-D01N-SFW TR-103-D01N-SFW TR-104-D01N-SFW TR-14-D01N-SFW TR-16-D01N-SFW TR-17-D01N-SFW TR-20-D01N-SFW	J/UJ CCB, MB-L
Vanadium	-0..1	-0.2	-0.1	-0.1	-0.1	-0.155	0.1	RB01D-SFW RB02D-SFW TR-101-D01N-SFW TR-102-D01N-SFW TR-103-D01N-SFW TR-104-D01N-SFW TR-14-D01N-SFW TR-16-D01N-SFW TR-17-D01N-SFW TR-20-D01N-SFW TR-9-D01N-SFW	UJ CCB, MB-L
Iron	---	---	---	---	---	37.8	35.5	TR-16-D01N-SFW TR-17-D01N-SFW TR-20-D01N-SFW	U MB-I

CCBx-Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: WAT306

Sampling Events: Rinsate Blanks for the Benthic Survey and GSI Studies

Matrix: Soil ☐ Sediment ☐ Water ☒ Biota ☐

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike

Date Completed: 11/04/04

Peer Reviewer: Stacey Coker

Date Completed: 12/03/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Analyses		
				Matrix	Metals[2]	Inorganics
RB01T-SED (09/25/04)	SA	588449		W	X	X
RB02T-SED (09/25/04)	SA	588450		W	X	
RB03T-SED (09/25/04)	SA	588451		W	X	X
RB04T-SED (09/26/04)	SA	588452		W	X	
RB05T-SED (09/26/04)	SA	588453		W	X	X
RB06T-SED (09/26/04)	SA	588454		W	X	
RB02T-SFW (10/01/04)	SA	589914		W	X	X
RB02D-SFW (10/01/04)	SA	589915		W	X	X[3]
RB02T-SED (10/01/04)	SA	589916	RB02T-SED-1001	W	X	X

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Total metals includes Aluminum and Iron only.

[3]For sample RB02D-SFW, only dissolved organic carbon was analyzed.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Two samples were received with the sample ID RB02T-SED, but with different collection dates. Due to the limitation of the metals reporting system that does not allow for the reporting of samples with identical Ids, it was necessary to add a date suffix to the ID (RB02T-SED-1001) for the sample collected 10/01/04.
Holding Times	No	Several samples in this SDG were received 1-2-days past holding time for the nitrite and orthophosphate analyses. Table 1 summarizes the samples that exceeded holding time and the resultant data qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • LD	N/A	Matrix QC samples were not analyzed with this SDG. The matrix quality control results for the September 2004 Benthic Survey and GSI Groundwater/ Surface Water Interaction Study Sampling Events will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RB01T-SED • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analysis was run on sample RB01T-SED. Because this sample is a rinsate blank, the serial dilution results are not considered applicable with respect to the site-specific sample matrix. Therefore, the serial dilution results were not evaluated for this sample. The serial dilution results for the September 2004 Benthic Survey and GSI Groundwater/ Surface Water Interaction Study Sampling Events will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for water samples.
Field QC • Field Duplicate • Rinsate Blank RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	N/A	Field duplicates samples were not included in this SDG. The field QC results for the September 2004 Benthic Survey and GSI Groundwater/ Surface Water Interaction Study Sampling Events will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The rinsate blank detections will be assessed collectively with all other rinsate blank results to determine the need for qualification.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the Benthic Survey Study.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Holding Time Qualifications for Inorganics

Sample	Nitrite (mg/L)	Orthophosphate (mg/L)
RB01T-SED (09/25/04)	0.0050 UJ	0.010 UJ
RB02T-SED (09/25/04)	0.0050 UJ	0.010 UJ
RB03T-SED (09/25/04)	0.0050 UJ	0.010 UJ
RB02T-SFW (10/01/04)	0.0050 UJ	0.010 UJ
RB02T-SED (10/01/04)	0.0050 UJ	0.010 UJ

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	0.6	0.7	0.7	---	0.30	RB01T-SED	U CCB-I
Arsenic	-0.1	-0.1	-0.1	---	0.10	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB-L
Cadmium	-0.2	-0.2	-0.2	-0.161	0.10	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB, MB-L
Copper	-1.2	-1.2	-1.2	-0.896	0.30	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB, MB-L
Molybdenum	0.6	---	---	---	0.40	RB01T-SED (09/25/04)	U CCB-I
Nickel	-1.4	-1.5	-1.5	-1.353	0.30	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB, MB-L

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Silver	-0.1	-0.1	-0.1	-0.107	0.10	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB, MB-L
Sodium	---	---	---	378.5	357.9	RB01T-SED (09/25/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	U MB-I
Vanadium	-0.3	-0.3	-0.3	-0.341	0.10	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB, MB-L
Zinc	-5.3	-5.4	-5.4	-3.247	1.9	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB, MB-L

CCBx-Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: SOL110 Sampling Event: Benthic Survey 2004

Matrix: Solid ☒ Water ☐ Biota ☐

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **Yes**

Data Reviewer: Karen Kronoveter Date Completed: 12/03/04

Peer Reviewer: Sheri O'Connor Date Completed: 01/06/05

The table below summarizes the results presented in this data package.

Field ID[1]	QC Type	Lab ID	Analyses		
			Matrix	Metals	Inorganics
TR-1N-T01N-SED	SA	588283	S	X	X
TR-2N-T01N-SED	SA	588286	S	X	X
TR-3N-T01N-SED	SA	588292	S	X	X
TR-10N-T01N-SED	SA	588295	S	X	X
TR-12N-T01N-SED	SA	588298	S	X	X

Matrix: S = Solid
QC Type: SA = Sample

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary: Issues noted in the case narrative, potentially affecting data quality, are addressed in the following discussion or covered in the data review summary table below.

The laboratory case narrative noted that in order to more accurately report TOC concentrations from peaks with areas lower than that of the lowest curve point (5000 mg/kg), the laboratory has implemented the use of an additional low-level calibration curve for processing the results for samples with small peak areas. All samples with peak areas from at least one replicate that are lower than the lowest calibration point are processed using this curve, as well as the associated blank analyses. In this delivery group, all samples were processed using this low-level curve. This did not affect the quality or usability of the TOC data results. It is noted that the preparatory blank associated with the samples in this delivery group exceeded the reporting limit (RL) referenced in the QAPP for TOC (100 mg/kg). The potential effect this had on the qualification of data results is addressed in the table under the section of method blanks.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 7 days after sampling and 5 days beyond log-in. The pH for all samples was measured 2 days beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time were assigned indeterminate direction of bias.
Method Blanks	No	TOC was detected in the method blank associated with analysis run of 09/28/04 at a concentration of 329 mg/Kg. All sample results for TOC were less than 5x the blank detection, resulting in the qualification of all TOC results as nondetect at the respective reported concentrations. In addition, chloride was detected in the method blank associated with the analysis run of 10/05/04 at a concentration of 0.32 mg/L. The one sample associated with this analysis run (TR-12N-T01N-SED) reported a chloride concentration of 0.30 mg/L (< 5x blank detection) and subsequently was qualified as nondetect at this reported concentration. The bias directions assigned to these qualifications were indeterminate. Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. However, several results were qualified on the basis of blank detections, as summarized in Table 1.2.
Matrix QC • MS/D TR-12N-T01N-SED • LD TR-12-T01N-SED • PDS TR-12-T01N-SED	No	Several analytes were recovered outside the acceptance range of 75-125% for the inorganics and metals matrix spike analysis of sample TR-12N-T01N-SED. The matrix spike recovery for sulfate was reported at 0%. Upon further inspection, it was determined by the laboratory that the recovery of 0% was not due to a matrix effect, but most likely due to analyst error, as it appears that the matrix spike associated with sample TR-12N-T01N-SED was inadvertently not fortified with the spiking solution. A previous analysis, which yielded sulfate results that exceeded the calibrated range exhibited acceptable matrix spike recoveries. Table 1.3 summarizes these analytes, along with their recoveries and qualifications to the parent samples. Post digestion spikes were performed on all metal analytes. The post digestion spike recoveries for those analytes that did not meet the specified criterion for the initial matrix spike recoveries were reviewed. As the reviewed post matrix spike recoveries were within 75-125%, no qualification on the basis of post digestion spike recoveries were necessary. Laboratory duplicate analysis results were reviewed to evaluate the precision of the laboratory analyses. Despite the fact that the laboratory duplicate summary forms reported relative percent differences (RPDs) in excess of the evaluation criterion for several metal analytes, no qualification of data was necessary when the CRDL was used in place of the IDL, adjusted for dilution, for the concentration-dependent comparison calculations. The matrix quality control results for the September 2004 Benthic Survey Study sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC • Serial Dilution TR-12N-T01N-SED • Internal Standards	No	The serial dilution analysis conducted on matrix spike sample TR-12N-T01N-SED was not applicable for 13 of the 24 metal analytes, respectively. The remaining analytes exhibited initial concentrations in excess of 50 times the IDL. The percent deviations between the original results and its 5-fold dilutions were compared to an evaluation criterion of ±10%. No qualification of data resulted on the basis of the serial dilution evaluation. The serial dilution results for the September 2004 Benthic Survey Study sampling event will be evaluated collectively and any additional data qualifications will be summarized in the overall assessment.
Field Quality Control (QC) • Field Duplicate • Rinsate Blank • Field Blank	N/A	Field QC samples were not included with the analyses of the samples in this data package. The field duplicate results for the September 2004 Benthic Survey Study sampling event will be evaluated collectively and any resultant data qualifications will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes", "No", or "N/A".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS • CRDL	Yes	Information regarding the mass calibration and resolution are not available due to the software limitations. However, acceptable performance can be inferred from the other QC sample results, which satisfied evaluation criteria. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, due to the fact that the interferent elements in the samples were not present in concentrations exceeding those of the interference check standard (ICS), the samples were not evaluated for any positive or negative biases suggested by the ICS A analyses.

Review Parameter	Criteria Met?	Comments
Laboratory Performance Parameters	Complete with "Yes", "No", or "N/A".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		CRDL – The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria, with the exception of the iron recovery of 59.7%. Associated iron sample results may potentially be biased low. Sample data were not qualified on the basis of CRDL standard recoveries.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Cond. (µmhos/cm)	pH (std units)
TR-12N-T01N-SED	73.1 J	7.1 J
TR-1N-T01N-SED	74.9 J	7.0 J
TR-2N-T01N-SED	104 J	5.8 J
TR-3N-T01N-SED	72.8 J	6.9 J
TR-10N-T01N-SED	80.3 J	7.4 J
TR-11-T01N-SED	82.2 J	7.3 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (mg/kg)	IDL (µg/l)	Samples Qualified	Qualification Codes
Antimony (MS)	1.0	1.1	1.1	0.330		TR-12N-T01N-SED	U MB,CCB-I
Cadmium (P)	---	---	---	0.328		TR-10N-T01N-SED TR-2N-T01N-SED	U MB-I
Sodium (P)	574.8	---	---	82.41		All sample results were qualified.	U MB,CCB-I U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Qualification Codes
TR-12N-T01N-SED				
Antimony	64.4	94.6	75-125%	UJ MS-L
Arsenic	42.1	88.5		J MS-L
Barium	64.5	97.6		J MS-L
Molybdenum	131.3	101.9		J MS-H
Zinc	49.5	83.4		J MS-L

NA = Not Applicable

MOLYCORP RI/FS

DATA REVIEW SUMMARY

Data Package Number: SOL111 Sampling Event: Benthic Survey 2004

Matrix: Solid ☒ Water ☐ Biota ☐

Sample-specific Parameter Review? **Yes** Laboratory Performance Parameters? **No**

Data Reviewer: Karen Kronoveter Date Completed: 12/08/04

Peer Reviewer: Stacey Coker Date Completed: 01/07/05

The table below summarizes the results presented in this data package.

Field ID[1]	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics
TR-5N-T01D-SED	FD	588568	S	X	X
TR-8N-T01N-SED	SA	588569	S	X	X
TR-6N-T01N-SED	SA	588570	S	X	X
TR-7N-T01N-SED	SA	588571	S	X	X
TR-13N-T01N-SED	SA	588572	S	X	X
TR-14N-T01N-SED	SA	588573	S	X	X
TR-17N-T01N-SED	SA	588574	S	X	X
TR-15N-T01N-SED	SA	588575	S	X	X
TR-5N-T01N-SED	SA	588576	S	X	X
TR-16N-T01N-SED	SA	588577	S	X	X
TR-4N-T01N-SED	SA	588578	S	X	X
TR-18N-T01N-SED	SA	588579	S	X	X
TR-19N-T01N-SED	SA	588580	S	X	X
TR-20N-T01N-SED	SA	588581	S	X	X
TR-101N-T01N-SED	SA	588582	S	X	X
TR-102N-T01N-SED	SA	588583	S	X	X
TR-103N-T01N-SED	SA	588584	S	X	X
TR-104N-T01N-SED	SA	588585	S	X	X
TR-9N-T01N-SED	SA	588586	S	X	X

Matrix: S = Solid
QC Type: SA = Sample FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary: Issues noted in the case narrative, potentially affecting data quality, are addressed in the following discussion or covered in the data review summary table below.

The laboratory case narrative noted that in order to more accurately report TOC concentrations from peaks with areas lower than that of the lowest curve point (5000MG/KG), the laboratory has implemented the use of an additional low-level calibration curve for processing the results for samples with small peak areas. All samples with peak areas from at least one replicate that are lower than the lowest calibration point are processed using this curve, as well as the associated blank analyses. In this delivery group, all samples were processed using this low-level curve. This did not affect the quality or usability of the TOC data results. It is noted that the preparatory blank associated with the samples in this delivery group exceeded the reporting limit (RL) referenced in the QAPP for TOC (10 mg/L). The potential effect this had on the qualification of data results is addressed in the table under the section of method blanks.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 4–6 days after sampling and 2 days beyond log-in. The pH for all samples was measured 4 days beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time were assigned indeterminate direction of bias.
Method Blanks	No	Several analytes were detected in the inorganics and metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. However, several results were qualified on the basis of blank detections, as summarized in Table 1.2.
Matrix QC • MS/D TR-13N-T01N-SED • LD TR-13N-T01N-SED • PDS TR-13N-T01N-SED	No	Several analytes were recovered outside the acceptance range of 75-125% for the inorganics and metals matrix spike analysis of sample TR-13N-T01N-SED. Table 1.3 summarizes these analytes, along with their recoveries and qualifications to the parent samples. Post digestion spikes were performed on all metal analytes. The post digestion spike recoveries for those analytes that did not meet the specified criterion for the initial matrix spike recoveries were reviewed. As the reviewed post matrix spike recoveries were within 75-125%, no qualification on the basis of post digestion spike recoveries were necessary. Laboratory duplicate analysis results were reviewed to evaluate the precision of the laboratory analyses. The lead sample result in sample TR-13N-T01N-GRW was qualified as estimated (J) with an indeterminate bias direction assigned. Both sample (25.55 mg/kg) and duplicate sample results (56.09 mg/kg) were in excess of 5x the Contract Required Detection Limit (CRDL) with a relative percent difference (RPD) of 74.8%. All other laboratory duplicate results met the criteria set forth in SOP 12.1 and therefore did not require qualification. The matrix quality control results for the September 2004 Benthic Survey Study sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Serial Dilution TR-13N-T01N-SED • Internal Standards	No	The serial dilution analysis conducted on matrix spike sample TR-13N-T01N-SED was not applicable for 13 of the 24 metal analytes. The remaining analytes exhibited initial concentrations in excess of 50 times the IDL. The percent deviations between the original results and its 5-fold dilutions were compared to an evaluation criterion of ±10%. No qualification of data resulted on the basis of the serial dilution evaluation.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		The serial dilution results for the September 2004 Benthic Survey Study sampling event will be evaluated collectively and any additional data qualifications will be summarized in the overall assessment.
Field Quality Control (QC) • Field Duplicate TR-5N-T01N/T01D-SED • Rinsate Blank • Field Blank	N/A	One field duplicate pair was assessed for field duplicate agreement. All geotechnical sample results for the parent field duplicate pair were qualified as estimated (J), with an indeterminate bias direction assigned. The geotechnical results for these two samples were not in agreement and could be due to the heterogeneous nature of the sample. The field duplicate results for the September 2004 Benthic Survey Study sampling event will be evaluated collectively and any additional data qualifications will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	**ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. Accordingly, several sample results were qualified on the basis of biases suggested by the ICS A analyses. Table 1.4 summarizes the analytes and samples for which qualification was necessary. **CRDL –** The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Cond. (µmhos/cm)	pH (std units)
TR-5N-T01D-SED	69.9 J	6.8 J
TR-8N-T01N-SED	84.4 J	7.2 J
TR-6N-T01N-SED	74.9 J	6.1 J
TR-7N-T01N-SED	110 J	5.1 J
TR-13N-T01N-SED	63.7 J	6.7 J
TR-14N-T01N-SED	78.5 J	7.0 J
TR-17N-T01N-SED	79.9 J	7.1 J
TR-15N-T01N-SED	56.6 J	7.2 J
TR-5N-T01N-SED	81.0 J	7.1 J
TR-16N-T01N-SED	77.6 J	7.2 J
TR-4N-T01N-SED	83.2 J	7.3 J
TR-18N-T01N-SED	73.1 J	7.3 J
TR-19N-T01N-SED	85.1 J	7.3 J
TR-20N-T01N-SED	87.3 J	7.3 J
TR-101N-T01N-SED	96.9 J	7.3 J
TR-102N-T01N-SED	133 J	6.8 J
TR-103N-T01N-SED	86.5 J	7.2 J
TR-104N-T01N-SED	90.6 J	7.2 J
TR-9S-T01N-SED	85.8 J	7.3 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (mg/kg)	IDL (mg/kg)	Samples Qualified	Qualification Codes
Chloride	---	---	---	0.32 (mg/L)	0.20 (mg/L)	All sample results were qualified.	U MB-I
TOC (09/30/04)	---	---	---	453	100	All sample results were qualified with the **exception** of: TR-5N-T01D-SED	U MB-I
TOC (10/05/04)	---	---	---	387	100		
Antimony (MS)	1.8	1.7	1.7	1.3	0.30 (µg/L)	All sample results were qualified.	U MB,CCB-I
Boron (P)	---	---	---	0.71	6.9 (µg/L)	All sample results were qualified with the **exception** of: TR-102N-T01N-SED TR-8N-T01N-SED	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.3
Matrix Spike Results and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Qualification Codes
TR-13N-T01N-SED				
Sulfate	137	NA	75-125%	J MS-H
Antimony	40.7	97.7		UJ MS-L
Arsenic	144.2	108.1		J MS-H
Copper	132.2	107.9		
Zinc	174.0	99.7		

NA = Not Applicable

Table 1.4
Interference Check Sample Evaluation

Analyte	Sol A (µg/L)	IDL (µg/L)	Qualified Samples	Qualification and Qualification Codes
Beryllium	36	6.9	TR-102N-T01N-SED	J ICS-H
Cadmium	7	0.5		

The interferent element iron was present in some samples at concentrations greater than that in the interference check samples (ICSs). As such, all samples were evaluated for positive and negative biases suggested by the ICS A. Data qualification was issued if the absolute values of the ICS A result was greater than the IDL and it suggested a positive or negative bias which accounted for more than 25% of associated sample results or reporting limits. (Note: The ICS A solution only contains the interferent elements [Al, Ca, Mg, and Fe] so any positive or negative result for other analyte is inferred to be a bias potentially caused by one or more of the interferent elements present.)

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE SEPTEMBER 2004 GROUNDWATER/SURFACE WATER INTERACTION STUDY,

A COMPONENT OF THE SUPPLEMENTAL SPRING 13 AND SPRING 39 SAMPLING EVENT

Prepared for

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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Dilution Schemes/Non-Detects With Elevated Rls 3-1
3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses 3-1
3.2.3 Non-Valid Matrix Spikes 3-2
3.2.4 Laboratory Performance Review (LPR) Findings 3-2

4. Section 4 FOUR Collective Summary/Assessment of Matrix QC 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.1.1 GSI Surface Water Matrix Spike Results 4-1
4.1.2 GSI Sediment Matrix Spike Results 4-2
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-3
4.3 Serial Dilution Results 4-4
4.3.1 GSI Surface Water Serial Dilution Results 4-5
4.3.2 GSI Piezometer Water Serial Dilution Results 4-5
4.3.3 GSI Sediment Serial Dilution Results 4-6

Section 5 Collective Summary/Assessment of Field QC 5-1

5.1 Field Duplicate Results 5-1
5.2 Rinsate Blank Results 5-2
5.2.1 GSI Surface Water Rinsate Blank Results 5-2
5.2.2 GSI Sediment Rinsate Blank Results 5-3
5.3 Field Blank Results 5-3

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-1
6.4 Representativeness 6-2
6.5 Comparability 6-2
6.6 Sensitivity 6-2

TABLE OF CONTENTS

List of Tables

Table 1-1	List of Field Samples Submitted for Analysis
Table 4-1	Field Samples Designated for Matrix QC Analysis
Table 4-2	Inorganics Matrix Spike Results for GSI Surface Water
Table 4-3	Inorganics Laboratory Duplicate Results
Table 4-4	Inorganic Laboratory Duplicate Exceedances
Table 4-5	ICP Serial Dilution Samples
Table 4-6	ICP Serial Dilution Results for GSI Surface Water
Table 4-7	ICP Serial Dilution Results for GSI Piezometer Water
Table 5-1	Summary of Field Duplicate GSI Samples Collected
Table 5-2	Summary of Field Duplicate GSI Sample Exceedances
Table 5-3	Summary of Rinsate Blank Results for GSI Surface Water
Table 5-4	Summary of Rinsate Blank Results for GSI Sediment Water

List of Attachments

Attachment 1.1	Data Review Summary for Data Package WAT306
Attachment 1.2	Data Review Summary for Data Package WAT308
Attachment 1.3	Data Review Summary for Data Package WAT309
Attachment 1.4	Data Review Summary for Data Package WAT311
Attachment 1.5	Data Review Summary for Data Package WAT312
Attachment 1.6	Data Review Summary for Data Package WAT313
Attachment 1.7	Data Review Summary for Data Package WAT315
Attachment 1.8	Data Review Summary for Data Package WAT316
Attachment 1.9	Data Review Summary for Data Package WAT317
Attachment 1.10	Data Review Summary for Data Package WAT318
Attachment 1.11	Data Review Summary for Data Package SOL114

This Data Validation Report (DVR) contains the results of the data validation conducted for 30 surface water samples, 30 piezometer samples, 30 chambers samples, 6 sediment samples, and associated quality control (QC) samples collected during the September 2004 Groundwater Surface Water Interaction (GSI) Study. The GSI Study was one component of the Supplemental Spring 13 and Spring 39 Sampling Event conducted as part of the Molycorp RI/FS. The following four matrices were sampled for the GSI Study:

- Surface Water
- Piezometer Water
- Chamber Water
- Sediment

The surface water, piezometer, chamber, and sediment samples were sent to STL Burlington (STL-B), in Colchester, Vermont for metals and inorganic parameters analysis. The results for the GSI study were reported in ten data packages. The results for the GSI surface water samples were reported in data packages WAT306, WAT308, WAT311, WAT313, WAT316, WAT317 and WAT318. The results for the GSI piezometer samples were reported in data packages WAT309, WAT312, WAT315, WAT316 and WAT318. The results for the GSI chambers samples were reported in data packages WAT309, WAT312, WAT315, WAT316 and WAT318. The results for the GSI sediment samples were reported in data package SOL114 (rinsate blank results for the GSI sediment samples were reported in WAT306).

- All GSI surface water samples were analyzed for total metals, dissolved metals and inorganic parameters (aqueous media);
- All GSI piezometer water samples were analyzed for dissolved metals and inorganic parameters (fluoride, sulfate, TOC and alkalinity only);
- All GSI chamber water samples were analyzed for dissolved metals and inorganic parameters (fluoride, sulfate and TOC only); and
- All GSI sediment samples were analyzed for total metals and inorganic parameters (solid media) as defined in the RI/FS QAPP.

This data validation report describes the data validation process used and presents the data review results for the surface water and associated QC samples submitted to STL for chemical analysis. The field sample IDs and associated data package numbers are provided in Table 1-1.

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
GSI Surface Water: total metals, dissolved metals and inorganic parameters (aqueous media)		
WAT308	RR-13B-T00N-SFW	
	RR-13B-D00N-SFW	
	RR-13A-T00N-SFW	
	RR-13A-D00N-SFW	
	RR-11B3-T00N-SFW	
	RR-11B3-D00N-SFW	
	RR-11B2-T00N-SFW	
	RR-11B2-D00N-SFW	
	RR-5BB-T00N-SFW	SA, MS, LD, SD
	RR-5BB-D00N-SFW	SA, MS, LD, SD
	ZWERGLE-T00N-SFW	
	ZWERGLE-D00N-SFW	
	ZWERGLE-T00D-SFW	FD to ZWERGLE-T00N-SFW
	ZWERGLE-D00D-SFW	FD to ZWERGLE-D00N-SFW
WAT311	RR-13B-T01N-SFW	
	RR-13B-D01N-SFW	
	RR-13A-T01N-SFW	
	RR-13A-D01N-SFW	
	RR-11B3-T01N-SFW	
	RR-11B3-D01N-SFW	
	RR-11B2-T01N-SFW	SA, MS, LD, SD
	RR-11B2-D01N-SFW	SA, MS, LD, SD
	RR-5BB-T01N-SFW	
	RR-5BB-D01N-SFW	
	RR-5BB-T01D-SFW	FD to RR-5BB-T01N-SFW
	RR-5BB-D01D-SFW	FD to RR-5BB-D01N-SFW
	ZWERGLE-T01N-SFW	
	ZWERGLE-D01N-SFW	
WAT313	RR-13B-T02N-SFW	
	RR-13B-D02N-SFW	
	RR-13A-T02N-SFW	
	RR-13A-D02N-SFW	
	RR-11B3-T02N-SFW	
	RR-11B3-D02N-SFW	
	RR-11B2-T02N-SFW	
	RR-11B2-D02N-SFW	
	RR-5BB-T02N-SFW	
	RR-5BB-D02N-SFW	
	ZWERGLE-T02N-SFW	
	ZWERGLE-D02N-SFW	

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
WAT316	RR-13B-T04N-SFW	
	RR-13B-D04N-SFW	
	RR-13A-T04N-SFW	SD
	RR-13A-D04N-SFW	
WAT317	RR-13B-T03N-SFW	
	RR-13B-D03N-SFW	
	RR-13A-T03N-SFW	
	RR-13A-D03N-SFW	SD
	RR-11B3-T03N-SFW	
	RR-11B3-D03N-SFW	
	RR-11B2-T03N-SFW	
	RR-11B2-T03N-SFW	
	RR-5BB-T03N-SFW	
	RR-5BB-D03N-SFW	
	ZWERGLE-T03N-SFW	
	ZWERGLE-D03N-SFW	
	RR-11B3-T04N-SFW	
	RR-11B3-D04N-SFW	
	RR-11B2-T04N-SFW	
	RR-11B2-D04N-SFW	
	RR-5BB-T04N-SFW	
	RR-5BB-D04N-SFW	
	ZWERGLE-T04N-SFW	
	ZWERGLE-D04N-SFW	
GSI Piezometer Water: dissolved metals and inorganic parameters (fluoride, sulfate, alkalinity and TOC only)		
WAT309	RR-13B-T00N-PS	
	RR-13B-D00N-PS	
	RR-13A-T00N-PS	
	RR-13A-D00N-PS	SD
	RR-11B3-T00N-PS	
	RR-11B3-D00N-PS	
	RR-11B2-T00N-PS	
	RR-11B2-D00N-PS	
	RR-5BB-T00N-PS	
	RR-5BB-D00N-PS	
	ZWERGLE-T00N-PS	
	ZWERGLE-D00N-PS	

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
WAT312	RR-13B-T01N-PS	
	RR-13B-D01N-PS	
	RR-13A-T01N-PS	
	RR-13A-D01N-PS	SD
	RR-11B3-T01N-PS	
	RR-11B3-D01N-PS	
	RR-11B2-T01N-PS	
	RR-11B2-D01N-PS	
	RR-5BB-T01N-SFW	
	RR-5BB-T01N-SFW	
	ZWERGLE-T01N-SFW	
	ZWERGLE-D01N-SFW	
WAT315	RR-13B-T02N-PS	
	RR-13B-D02N-PS	
	RR-13A-T02N-PS	
	RR-13A-D02N-PS	
	RR-11B3-T02N-PS	
	RR-11B3-D02N-PS	
	RR-11B2-T02N-PS	
	RR-11B2-D02N-PS	
	RR-5BB-T02N-PS	
	RR-5BB-D02N-PS	
	ZWERGLE-T02N-PS	
	ZWERGLE-D02N-PS	SD
WAT316	RR-13B-T04N-PS	
	RR-13B-D04N-PS	
	RR-13A-T04N-PS	
	RR-13A-D04N-PS	SD
WAT318	RR-13B-T03N-PS	
	RR-13B-D03N-PS	
	RR-13A-T03N-PS	
	RR-13A-D03N-PS	SD
	RR-11B3-T03N-PS	
	RR-11B3-D03N-PS	
	RR-11B2-T03N-PS	
	RR-11B2-D03N-PS	
	RR-5BB-T03N-PS	
	RR-5BB-D03N-PS	
	ZWERGLE-T03N-PS	
	ZWERGLE-D03N-PS	
	RR-11B3-T04N-PS	
	RR-11B3-D04N-PS	
	RR-11B2-T04N-PS	
	RR-11B2-D04N-PS	
	ZWERGLE-T04N-PS	
	ZWERGLE-D04N-PS	

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
GSI Chamber Water: dissolved metals and inorganic parameters (fluoride, sulfate, TOC)		
WAT309	RR-13B-T00N-WSC	
	RR-13B-D00N-WSC	
	RR-13A-T00N-WSC	
	RR-13A-D00N-WSC	
	RR-11B3-T00N-WSC	
	RR-11B3-D00N-WSC	
	RR-11B2-T00N-WSC	
	RR-11B2-D00N-WSC	
	RR-5BB-T00N-WSC	
	RR-5BB-D00N-WSC	
	ZWERGLE-T00N-WSC	
	ZWERGLE-D00N-WSC	
WAT312	RR-13B-T01N-WSC	
	RR-13B-D01N-WSC	
	RR-13A-T01N-WSC	
	RR-13A-D01N-WSC	
	RR-11B3-T01N-WSC	
	RR-11B3-D01N-WSC	
	RR-11B2-T01N-WSC	
	RR-11B2-D01N-WSC	
	RR-5BB-T01N-WSC	
	RR-5BB-D01N-WSC	
	ZWERGLE-T01N-WSC	
	ZWERGLE-D01N-WSC	
WAT315	RR-13B-T02N-WSC	
	RR-13B-D02N-WSC	
	RR-13A-T02N-WSC	
	RR-13A-D02N-WSC	
	RR-11B3-T02N-WSC	
	RR-11B3-D02N-WSC	
	RR-11B2-T02N-WSC	
	RR-11B2-D02N-WSC	
	RR-5BB-T02N-WSC	
	RR-5BB-D02N-WSC	
	ZWERGLE-T02N-WSC	
	ZWERGLE-D02N-WSC	
WAT316	RR-13B-T04N-WSC	
	RR-13B-D04N-WSC	
	RR-13A-T04N-WSC	
	RR-13A-D04N-WSC	

Table 1-1
List of Field Samples Submitted for Analysis

Data Package	Field ID Recorded on COC	QC Designation
WAT318	RR-13B-T03N-WSC	
	RR-13B-D03N-WSC	
	RR-13A-T03N-WSC	
	RR-13A-D03N-WSC	
	RR-11B3-T03N-WSC	
	RR-11B3-D03N-WSC	
	RR-11B2-T03N-WSC	
	RR-11B2-D03N-WSC	
	RR-5BB-T03N-WSC	
	RR-5BB-D03N-WSC	
	ZWERGLE-T03N-WSC	
	ZWERGLE-D03N-WSC	
	RR-11B3-T04N-WSC	
	RR-11B3-D04N-WSC	
	RR-11B2-T04N-WSC	
	RR-11B2-D04N-WSC	
	RR-5BB-T04N-WSC	
	RR-5BB-D04N-WSC	
	ZWERGLE-T04N-WSC	
	ZWERGLE-D04N-WSC	
GSI Sediment: dissolved metals and inorganic parameters (solid media)		
SOL094	RR-13B-T04N-SED	
	RR-13A-T04N-SED	
	RR-11B3-T04N-SED	
	RR-11B2-T04N-SED	
	RR-11B2-T04D-SED	FD for RR-11B2-T04N-SED
	RR-5BB-T04N-SED	
	ZWERGLE-T04N-SED	

FD = Field Duplicate MS = Matrix Spike PS = Piezometer Composite Sample
SD = Serial Dilution LD = Laboratory Duplicate WSC = Within Sediment Chamber

The review consisted of evaluation of laboratory performance criteria and sample-specific criteria in accordance with SOP 12.1.

The review of sample-specific parameters includes evaluating parameters that are sample related. These include: case narrative comments, chain-of-custody and sample condition upon receipt, holding times, method blank results, matrix spike recoveries, laboratory duplicate or spike duplicate analysis, post-digestion spike recoveries, ICP serial dilution analysis agreement, internal standard performance, and results for field quality control samples (e.g., field duplicates and rinsate blanks).

The review of laboratory performance parameters includes evaluating operations that are in the control of the laboratory, but are independent of the field samples being analyzed. These include: initial calibration, initial and continuing calibration verification, laboratory control sample analysis, compound identification, result calculation (i.e., quantitation), data transcription (i.e., verification), and method specific quality control requirements (e.g., thermal stability, tuning, resolution, mass calibration, interference check sample analysis). Evaluation of these parameters provides an assessment of overall system performance. Laboratory performance parameters were reviewed for at least 10% of the RI/FS data packages (per method per sampling event) received. Problems identified during the laboratory performance parameter review as potentially being systematic laboratory performance issues were then also evaluated in all data packages.

The hierarchy for acceptance criteria used to evaluate each of the parameters is specified in SOP 12.1 and is as follows: if no criteria are specified in the SOP, then the criteria specified in the RI/FS QAPP were used; if no criteria are specified in the SOP or the QAPP then the method specified acceptance limits were used; if no criteria are specified in the SOP, QAPP or method, then the acceptance ranges based on laboratory historical data were used.

Section 3.0 summarizes the packages used to evaluate laboratory performance parameters and data quality issues pertinent to all samples. The data validation summary reports for all pertinent data packages are presented in Attachment 1. In all cases of professional judgment exercised in evaluating the need for qualification, the basis for the professional judgment used is provided in the data validation summary report.

The site-specific matrix spike (MS) results, laboratory duplicate results, serial dilution results, blanks (field and rinsate), field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered to be much more representative of the site sample matrix and are a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a

given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 4.0 provides the collective assessment of the matrix QC results (MS/MSD results, laboratory duplicate results, and serial dilution results) and associated sample qualification. Section 5.0 presents the collective summary of the field QC results (field and rinsate blanks and field duplicate results) and associated sample qualification. An overall assessment of data, with respect to the PARCC parameters and sensitivity, is presented in Section 6.0.

The subsections below cover the data review narrative summaries and the general data quality issues that relate to all packages.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for the data packages included in this event. In order to attain the frequency requirements for laboratory performance reviews, two data package (WAT316 and SOL114) were evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. If any problems were noted during review of the STL laboratory performance criteria, then all data packages were reviewed for the parameters not meeting acceptance criteria during the laboratory performance criteria review. All samples were also reviewed for the sample-specific criteria described in Section 2.0. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were evaluated to identify whether any findings globally affect all relevant samples analyzed for the GSI study. Although most of these issues may have been addressed in the individual summary reports, it was considered necessary to summarize them, and any observations, in this data validation report.

3.2.1 Dilution Schemes/Non-Detects With Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. Consequently, non-detect results were reported with proportionately elevated RLs. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

During the project, the need to analyze all surface water samples without dilution, regardless of pH, was identified. As such, surface water samples were generally analyzed without dilution, unless dilution was necessary based on analyte concentrations present in the sample. Similarly, the piezometer and chamber water samples were analyzed at the lowest dilutions possible.

3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilibria were

found to affect the matrix spike recoveries more than the expected accuracy of the method. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not assessed for accuracy.

3.2.3 Non-Valid Matrix Spikes

There were certain scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. These are as follows:

- For metals, when the parent sample concentrations were significantly greater than the spiking concentrations (i.e., greater than or equal to four times the spiking concentration), the ability to determine accuracy in the analysis was not accurate as the spike level becomes nominal compared with the original sample concentration; and
- Instances in which the reporting limits were increased due to dilution factors, which affected the reliable quantitation of the spiked analytes. In other words, the spike concentration is diluted out of the quantifiable range of the method. In these situations, the reporting limit was typically greater than the spike concentration added.

3.2.4 Laboratory Performance Review (LPR) Findings

The evaluation of laboratory performance criteria was conducted as described in Section 2.0. STL data packages WAT316 and SOL114 were used to evaluate laboratory performance criteria. If data qualification was required due to a specific laboratory performance parameter, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated for all packages for this event included:

- Continuing Calibration Verification (CCV) results;
- Initial Calibration Verification (ICV) results; and
- Laboratory Control Sample (LCS) recovery results.

The site-specific matrix spike (MS) results, laboratory duplicate (LD) results, and serial dilution results, were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. The following three subsections present a discussion on the MS analysis, LD analyses, and the serial dilution results for the samples collected during the sampling event.

Table 4-1 illustrates the site-samples that were used to prepare matrix spike samples. As two matrix spikes were prepared and analyzed for metals, dissolved metals and inorganic parameters for 30 GSI surface water field sample sites (excluding field duplicate samples), and one matrix spike was prepared and analyzed for metals and inorganic parameters for 6 GSI sediment field sample sites (excluding field duplicate samples). The QAPP frequency for matrix QC samples (5%) was satisfied. Matrix spike analyses were not possible for the GSI chamber water and GSI piezometer water samples due to the limited volume available at each site.

Table 4-1
Field Samples Designated for Matrix QC Analysis

Matrix	Sample ID	Matrix	Data Package	Analyses
GSI SFW	RR-5BB-T00N-SFW	Surface Water	WAT308	Metals and Inorganic Parameters
	RR-5BB-D00N-SFW	Surface Water	WAT308	Dissolved Metals
	RR-11B2-T01N-SFW	Surface Water	WAT311	Metals and Inorganic Parameters
	RR-11B2-D01N-SFW	Surface Water	WAT311	Dissolved Metals
GSI Sediment	RR-5BB-T04N-SED	Sediment	SOL114	Metals and Inorganic Parameters

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

A number of spike recoveries were outside of the QC acceptance limits of 75%-125%. In general, if less than a quarter of the valid spike recoveries for a given analyte were outside of the acceptance range, only the parent samples were qualified as estimated. If more than a quarter were outside of the acceptance range, the results for that analyte in all samples of the same matrix were qualified. However, the reviewer did take other factors into consideration such as the average MS percent recoveries, the magnitude of outages, and the number of valid spike recoveries relative to the size of the sample set.

Post-digestion spikes were conducted for all ICP and ICP/MS analytes to aid in determining whether the MS exceedances were caused by the sample matrix, a bias in the analytical system, or a combination of both. Recoveries for all post-digestion spikes were within the acceptance limits. Based on the post-digestion spike recoveries, it is probable that the matrix spike exceedances observed were due to a matrix effect on digestion rather than a bias in the analytical system.

4.1.1 GSI Surface Water Matrix Spike Results

Table 4-2 summarizes the GSI surface water results for each analyte, the number of high and low exceedances, and the number of spikes that were considered valid (i.e., the sample concentration was no greater than four times the spike added).

Table 4-2
Inorganics Matrix Spike Results for GSI Surface Water

Analyte	Total				Dissolved				Action
	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	Number of Valid Spike Results	%R <75	%R >125	Average MS %R	
Aluminum	2	0	0	106.2	2	0	0	107.4	None
Antimony	N/A	N/A	N/A	N/A	2	0	0	96.4	None
Arsenic	N/A	N/A	N/A	N/A	2	0	0	95.2	None
Barium	N/A	N/A	N/A	N/A	2	0	0	100.0	None
Beryllium	N/A	N/A	N/A	N/A	2	0	0	103.8	None
Boron	N/A	N/A	N/A	N/A	2	0	0	101.7	None
Cadmium	N/A	N/A	N/A	N/A	2	0	0	94.6	None
Chromium	N/A	N/A	N/A	N/A	2	0	0	102.2	None
Cobalt	N/A	N/A	N/A	N/A	2	0	0	100.2	None
Copper	N/A	N/A	N/A	N/A	2	0	0	103.5	None
Iron	2	0	0	106.8	2	0	0	105.0	None
Lead	N/A	N/A	N/A	N/A	2	0	0	103.1	None
Manganese	N/A	N/A	N/A	N/A	2	0	0	102.6	None
Nickel	N/A	N/A	N/A	N/A	2	0	0	104.7	None
Mercury	N/A	N/A	N/A	N/A	2	0	0	98.1	None
Selenium	N/A	N/A	N/A	N/A	2	0	0	82.4	None
Molybdenum	N/A	N/A	N/A	N/A	2	0	0	102.1	None
Silver	N/A	N/A	N/A	N/A	2	0	0	118.2	None
Thallium	N/A	N/A	N/A	N/A	2	0	0	103.1	None
Vanadium	N/A	N/A	N/A	N/A	2	0	0	100.4	None
Zinc	N/A	N/A	N/A	N/A	2	0	0	101.2	None
Cyanide	2	0	0	105.9	NA	NA	NA	NA	None
Chloride	2	0	**1**	129	NA	NA	NA	NA	Qualify all detect SFW chloride results as J MS-H
Total Alkalinity	2	0	0	110	NA	NA	NA	NA	None
Fluoride	2	0	0	101	NA	NA	NA	NA	None
Nitrate/ Nitrite	2	0	0	82	NA	NA	NA	NA	None
Nitrite	2	0	0	112	NA	NA	NA	NA	None
Orthophosphorous	2	0	0	104	NA	NA	NA	NA	None
Phosphorous	2	0	0	103	NA	NA	NA	NA	None
Sulfate	2	0	0	98	NA	NA	NA	NA	None
TOC	2	0	**1**	111	NA	NA	NA	NA	Qualify parent sample as estimated J MS-H

All surface water sample matrix spike recoveries except for two were within limits. For TOC, qualification was limited to only the parent sample because the average matrix spike percent recovery was within QC acceptance limits. For chloride, all positive sample results were qualified since the average recovery was above QC acceptance limits.

4.1.2 GSI Sediment Matrix Spike Results

For GSI sediment data, one sample was used for matrix spike analysis. All matrix spike recoveries were within QC acceptable limits, except for antimony, which yielded a recovery of 52.5%. As there was only one QC sample to represent a limited data set (i.e., six samples), data qualification based on matrix spike recoveries was limited to the parent sample only because one

QC sample was not considered adequate to assess whether or not a generalized matrix problem exists.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Table 4-3 illustrates the site-samples that were used to prepare laboratory duplicate samples. As two laboratory duplicates were prepared and analyzed for metals, dissolved metals and inorganic parameters for 30 GSI surface water field samples (excluding field duplicate samples), the QAPP frequency for matrix QC samples (5%) was satisfied. Laboratory duplicate analyses were not possible for the GSI chambers water and GSI piezometer water samples due to the limited sample volume available at each site.

Table 4-3
Inorganics Laboratory Duplicate Results

Matrix	Sample ID	Matrix	Data Package	Analyses
GSI SFW	RR-5BB-T00N-SFW	Surface Water	WAT308	Metals and Inorganic Parameters
	RR-5BB-D00N-SFW	Surface Water	WAT308	Dissolved Metals
	RR-11B2-T01N-SFW	Surface Water	WAT311	Metals and Inorganic Parameters
	RR-11B2-D01N-SFW	Surface Water	WAT311	Dissolved Metals
GSI Sediment	RR-5BB-T04N-SED	Sediment	SOL114	Metals and Inorganic Parameters

Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The relative percent differences (RPD) criterion ≤20% (≤35% for sediments) was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For laboratory duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than one times the greater RL (less than two times the greater RL for sediment). For metals data, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL, which was considered to be too low to be used as the baseline for these concentration dependent evaluations.

The RPDs or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within the QAPP acceptance limits for all laboratory duplicate analyses, with two exceptions. The exceptions and the resultant data qualifiers are summarized in the Table 4-4 below.

Table 4-4
Inorganic Laboratory Duplicate Exceedances

Matrix	Analyte	Sample ID	Criterion	Exceedance	Action
GSI Sediment	TOC	RR-5BB-T04N-SED	RPD≤35%	RPD=41.0%	J D-I for parent sample only.

For the GSI sediment samples, qualification was limited to the parent sample. One laboratory duplicate was not considered adequate to assess whether the matrix effect was sample-specific or a generalized issue for the sample set of six samples. No further qualifications of data were necessary.

4.3 SERIAL DILUTION RESULTS

Serial dilution tests involve the analysis of a sample and a five-fold dilution of the same sample. When analyte concentrations are sufficiently high (i.e., greater that 50x the instrument detection limit [IDL]), the original result and diluted sample result are expected to be fairly comparable. If the results are not comparable, it is generally assumed that there are matrix interferences that are resulting in the suppression or elevation of the signal for one or more analytes.

The original and diluted sample results are compared by a percent difference (%D). When %Ds ≤10% are obtained, it can be ascertained that there aren't any significant matrix related interferences present. However, when %Ds greater than 10% are obtained, matrix-related interferences potentially affecting the accuracy of the results may be present. It is generally assumed that the diluted sample results are more accurate that the original sample results as dilution serves to reduce the effects of the interferences. As such, a comparison of the original sample result to the diluted sample results may be used to assess a bias direction associated with the initial sample result. As illustrated by the Table 4-5 below, serial dilution tests were conduced on six surface water samples representing the GSI surface water matrix, four groundwater samples representing the GSI piezometer water and GSI chamber water matrices, and one sediment sample representing the GSI sediment matrix.

Table 4-5
ICP Serial Dilution Samples

Matrix	Sample ID	Matrix	Data Package	Analyses
GSI SFW	RR-5BB-T00N-SFW	Surface Water	WAT308	Metals
	RR-5BB-D00N-SFW	Surface Water	WAT308	Dissolved Metals
	RR-11B2-T01N-SFW	Surface Water	WAT311	Metals
	RR-11B2-D01N-SFW	Surface Water	WAT311	Dissolved Metals
	RR-13A-D04N-SFW	Surface Water	WAT316	Dissolved Metals
	RR-13A-D03N-SFW	Surface Water	WAT317	Dissolved Metals
GSI Piezometer[1]	RR-13A-D00N-PS	Groundwater	WAT309	Dissolved Metals
	RR-13A-D01N-PS	Groundwater	WAT312	Dissolved Metals
	ZWERGLE-D02N-PS	Groundwater	WAT315	Dissolved Metals
	RR-13A-D03N-PS	Groundwater	WAT318	Dissolved Metals
GSI Sediment	RR-5BB-T04N-SED	Sediment	SOL114	Metals

[1] Also considered representative of the chamber water matrix as the chambers were installed within the sediment (i.e., below the surface water/sediment interface).

A number of %Ds between the original sample results and the result obtained from a sample diluted 1:5 were >10%. In general, qualification was generally limited to the parent samples if less than a quarter of the valid serial dilution results for a given metal were outside of the acceptance range. Conversely, qualification was generally considered necessary if more than a quarter of the results for a metal were outside the acceptance range. However, factors such as the number of valid measurements relative to the size of the sample set, the average %D, and the magnitude of outages were also taken into consideration.

4.3.1 GSI Surface Water Serial Dilution Results

Table 4-6 summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued for all GSI surface water results.

Table 4-6
ICP Serial Dilution Results for GSI Surface Water

Analyte	Total Metals					Dissolved Metals					Action
	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		
				Low	High				Low	High	
Aluminum	2	0	1.8	0	0	2	0	2.5	0	0	None
Antimony	N/A	N/A	N/A	N/A	N/A	2	0	6.5	0	0	None
Arsenic	N/A	N/A	N/A	N/A	N/A	2	**1**	10.2	1	0	J DL-L for parent sample
Barium	N/A	N/A	N/A	N/A	N/A	2	0	0.4	0	0	None
Beryllium	N/A	N/A	N/A	N/A	N/A	2	0	1.7	0	0	None
Boron	N/A	N/A	N/A	N/A	N/A	2	0	1.6	0	0	None
Cadmium	N/A	N/A	N/A	N/A	N/A	2	0	5.0	0	0	None
Calcium	N/A	N/A	N/A	N/A	N/A	4	0	0.6	0	0	None
Chromium	N/A	N/A	N/A	N/A	N/A	2	0	3.0	0	0	None
Cobalt	N/A	N/A	N/A	N/A	N/A	2	0	0.6	0	0	None
Copper	N/A	N/A	N/A	N/A	N/A	2	0	3.5	0	0	None
Iron	2	0	7.9	0	0	2	0	5.5	0	0	None
Lead	N/A	N/A	N/A	N/A	N/A	2	0	0.9	0	0	None
Magnesium	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	None
Manganese	N/A	N/A	N/A	N/A	N/A	3	0	0.5	0	0	None
Nickel	N/A	N/A	N/A	N/A	N/A	2	0	1.3	0	0	None
Selenium	N/A	N/A	N/A	N/A	N/A	2	**2**	15.0	2	0	J/UJ DL-L for all samples
Molybdenum	N/A	N/A	N/A	N/A	N/A	2	0	1.2	0	0	None
Silver	N/A	N/A	N/A	N/A	N/A	2	0	2.8	0	0	None
Potassium	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	None
Thallium	N/A	N/A	N/A	N/A	N/A	2	0	1.5	0	0	None
Vanadium	N/A	N/A	N/A	N/A	N/A	2	0	1.6	0	0	None
Sodium	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	None
Zinc	N/A	N/A	N/A	N/A	N/A	2	0	2.2	0	0	None

Because only 2 out of 4 of the serial dilution results were valid for arsenic, the single exceedance was marginal, and the average %D was nearly within limits, qualification was limited to the parent sample. Selenium exhibited 2 of 2 valid serial dilution results, as well as average differences, outside QC acceptance limits. As such, qualification was applied to all GSI surface water selenium results.

4.3.2 GSI Piezometer Water Serial Dilution Results

The table below summarizes the number of valid serial dilution results for each metal, the number of results outside the acceptance range, the number of high and low exceedances, and the resultant data qualification issued for all GSI Piezometer Water results.

Table 4-7
ICP Serial Dilution Results for GSI Piezometer Water

Analyte	Dissolved Metals					Action
	Number of Valid Results	%Ds >10%	Average %D	Potential Bias Direction		
				Low	High	
Aluminum	3	0	7.3	0	0	None
Antimony	0	N/A	N/A	N/A	N/A	None
Arsenic	0	N/A	N/A	N/A	N/A	None
Barium	0	N/A	N/A	N/A	N/A	None
Beryllium	0	N/A	N/A	N/A	N/A	None
Boron	0	N/A	N/A	N/A	N/A	None
Cadmium	3	1	7.1	1	0	J DL-L for parent sample
Calcium	4	0	6.2	0	0	None
Chromium	0	N/A	N/A	N/A	N/A	None
Cobalt	0	N/A	N/A	N/A	N/A	None
Copper	3	0	3.5	0	0	None
Iron	3	0	7.5	0	0	None
Lead	0	N/A	N/A	N/A	N/A	None
Magnesium	3	0	5.4	0	0	None
Manganese	4	0	7.7	0	0	None
Nickel	3	0	2.3	0	0	None
Selenium	0	N/A	N/A	N/A	N/A	None
Molybdenum	0	N/A	N/A	N/A	N/A	None
Silver	0	N/A	N/A	N/A	N/A	None
Potassium	0	N/A	N/A	N/A	N/A	None
Thallium	0	N/A	N/A	N/A	N/A	None
Vanadium	0	N/A	N/A	N/A	N/A	None
Sodium	0	N/A	N/A	N/A	N/A	None
Zinc	3	1	9.9	1	0	J DL-L for parent sample

Only the parent sample results were qualified for cadmium and zinc because the outlying results were only marginally outside criteria and the average %Ds were within the acceptance limit. No further qualifications of data were necessary. The serial dilution tests on the piezometer matrix (i.e., groundwater) are also considered to be representative of the chamber water matrix as the chambers were installed within the sediment below the surface water/sediment interface.

4.3.3 GSI Sediment Serial Dilution Results

For GSI sediment data, a serial dilution analysis was performed on one sample. All serial dilution analyses were within QC acceptable limits, therefore, no qualification was necessary.

The site-specific blanks (rinsate) and field duplicate results were assessed collectively by matrix and sampling event to determine the need for qualification of sample results of similar matrix. Field duplicate agreement was assessed to determine the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. The following sections present a discussion on the field duplicate results, rinsate blank results, and the field blank results associated with the samples collected during the sampling event.

Table 5-1 presents the field duplicates collected for this event. As two field duplicates were prepared and analyzed for metals, dissolved metals and inorganic parameters for 30 GSI surface water field samples (excluding field duplicate samples), and one field duplicate was prepared and analyzed for metals and inorganic parameters for 6 GSI sediment field samples (excluding field duplicate samples), the QAPP required frequency of 5% for field duplicates was satisfied. Field duplicate analyses were not possible for the GSI chamber water and piezometer water samples due to the limited sample volume available at each site.

Table 5-1
Summary of Field Duplicate GSI Samples Collected

Matrix	Sample ID	Matrix	Data Package	Analyses
GSI SFW	ZWERGLE-T00D-SFW	Surface Water	WAT308	Metals and Inorganic Parameters
	ZWERGLE-D00D-SFW	Surface Water	WAT308	Dissolved Metals
	RR-5BB-T01D-SFW	Surface Water	WAT311	Metals and Inorganic Parameters
	RR-5BB-D01D-SFW	Surface Water	WAT311	Dissolved Metals
GSI Sediment	RR-11B2-T04D-SED	Sediment	SOL114	Metals and Inorganic Parameters

5.1 FIELD DUPLICATE RESULTS

Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria summarized as follows as required in the QAPP. The RPD criterion ≤30% (≤50% for sediments) was applied for cases in which both the sample and sample duplicate concentration were greater than five times the RL. For field duplicate pairs where the sample or duplicate concentration was less than five times the RL, the absolute difference between the sample and duplicate was compared to the criterion of less than two times the greater RL (<3.5xRL for sediments). For metals data, the CRDL is used in place of the RL for duplicate evaluations rather than the RL because the laboratory reported the IDL as the quantitative RL and the IDL; the IDL was considered to be too low to be used as the baseline for these concentration dependent evaluations. With two exceptions, the applicable evaluation criterion was met. The exception and the resultant data qualifiers are summarized in the table below.

Table 5-2
Summary of Field Duplicate GSI Sample Exceedances

Matrix	Analyte	Sample ID	Criterion	Exceedance	Action
GSI SFW	TDS	ZWERGLE-T00N-SFW/ ZWERGLE-T00D-SFW	AD≤2 x RL	AD= 2.2 x RL	J FD-I for parent samples only.
GSI SFW	TSS	RR-5BB-T01N-SFW/ RR-5BB-T01D-SFW	RPD≤30%	RPD= 57.1%	J FD-I for parent samples only.

Qualification was limited to parent samples only because the exceedances were slight, and minimal in number, (only one out of two field duplicate results were outside criteria).

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. The rinsate blanks for the GSI surface water matrix were given field IDs of RB01T/RB01D-SFW and RB02T/RB02D-SFW. The rinsate blanks for the GSI sediment matrix were given field IDs of RB01T-SED, RB02T-SED, RB03T-SED, RB04T-SED, RB05T-SED, and RB06T-SED. No rinsate blanks were prepared for the GSI piezometer and GSI chambers water matrices because sampling for these matrices was done using dedicated tubing and/or disposable samplers.

As two rinsate blanks were prepared and analyzed for metals, dissolved metals and inorganic parameters for 30 GSI surface water field samples and six rinsate blank were prepared and analyzed for metals and inorganic parameters for six GSI sediment field samples, the QAPP frequency for rinsate blank QC samples (5%) was satisfied.

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to aqueous sample results that were less than five times the average rinsate blank concentration. In the case of nondetect results for one rinsate blank, but not the other, one half of the RL was used in the calculation of the average rinsate blank concentration as this approach was considered more appropriate than using a zero for the nondetect result or biasing the average high by using the reporting limit.

5.2.1 GSI Surface Water Rinsate Blank Results

Table 5-3 summarizes the detected rinsate blank results for the GSI surface water matrix.

Table 5-3
Summary of Rinsate Blank Results for GSI Surface Water

Analyte	Sample ID	Conc.	RL	Frequency of Detection	Average RB Concentration	Range for Field Samples	Number of Samples Qualified	Action
Inorganic Parameters (mg/L)								
Bicarbonate Alkalinity	RB01T-SFW	2.9	1.0	2 of 2	3.1	64.3 to 87.9	0	U RB-I for all sample results ≤15.3 mg/L[1]
	RB02T-SFW	3.2						
Dissolved Organic Carbon	RB01D-SFW	1.5	1	1 of 2	1.0	1.0 to 10.1	20	U RB-I for all sample results ≤5.0 mg/L
Total Alkalinity	RB01T-SFW	2.9	1.0	2 of 2	3.1	64.3 to 87.9	0	U RB-I for all sample results ≤15.3 mg/L[1]
	RB02T-SFW	3.2						
Total Dissolved Solids	RB02T-SFW	30	5	1 of 2	16.3	100 to 266	0	U RB-I for all sample results ≤81.5 mg/L[1]
Total Organic Carbon	RB01T-SFW	1.1	1	1 of 2	0.8	1.0 to 2.5	22	U RB-I for all detect TOC results

In calculating the average rinsate blank concentration, one half of the RL was used for nondetect results.

[1] No qualification was necessary because all sample concentrations were greater than the qualification threshold.

While some results were qualified as non-detect based on rinsate results, the rinsate blanks are generally considered to be indicative of acceptable decontamination procedures as detections were infrequent and at relatively low levels.

5.2.2 GSI Sediment Rinsate Blank Results

The table below summarizes the detected rinsate blank results for the GSI Sediment event.

Table 5-4
Summary of Rinsate Blank Results for GSI Sediment Water

Analyte	Sample ID	Conc.	RL	Frequency of Detection	Average RB Concentration	Range for Field Samples
Inorganic Parameters (mg/L)						
TOC	RB02T-SED	1.8	1.0	1 of 2	0.72	599 to 2010 mg/kg[1]

In calculating the average rinsate blank concentration, one half of the RL was used for nondetect results.

[1] No qualification issued because all sample concentrations were greater than the qualification threshold.

TOC was the only analyte detected in the sediment rinsate samples. Since the sample results were greater than 5x the average rinsate blank contamination, no qualifications of data were necessary.

5.3 FIELD BLANK RESULTS

Field blanks are used to assess the potential introduction of contaminants from ambient sources to the sample during sample collection. Field blanks are only required by the QAPP when samples are analyzed for organics. Therefore, no field blanks were collected in association with the samples collected during this sample event.

All data are considered acceptable for use in meeting project objectives as qualified. Some sample results were qualified as nondetect on the basis of laboratory blank or rinsate blank contamination. Some sample results were qualified as estimated on the basis of the LCS or MS results or holding time exceedances. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives. A general overall assessment of each of the QAPP's data quality assurance objectives is provided below.

6.1 PRECISION

Precision is a measure of mutual agreement among replicate (or between duplicate) or co-located sample measurements of the same analyte. The closer the numerical values of the measurements are to each other, the more precise the measurement. Precision for a single analyte was expressed as a RPD or absolute difference between results of field duplicate results and laboratory duplicate samples.

For the GSI surface water matrix 99% of the field duplicate and laboratory results satisfied the applicable criteria. For the GSI piezometer matrix, 100% laboratory duplicate results satisfied the applicable criteria. For the GSI sediment matrix, 100% of the field duplicate and 97% of laboratory results satisfied the applicable criteria. As such, the overall level of precision demonstrated is considered to be acceptable.

6.2 ACCURACY

Accuracy is a measure of bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. This was expressed as the percent recovery for LCS and MS samples.

All of the LCS results satisfied the applicable evaluation criteria for accuracy specified in the QAPP, which is considered to be indicative of acceptable overall accuracy with respect to the analytical system.

The MS recoveries suggested that the overall accuracy attained with respect to the site-specific sample matrices are satisfactory as 96%, and 97% of the MS recoveries for the GSI surface water and sediment matrices, respectively, were within the QAPP acceptance range of 75-125%. Sample results were qualified accordingly as estimated due to low or high matrix spike recoveries.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results for the 107 samples analyzed (96 field samples, 3 field duplicates, and 8 rinsate blanks) are considered usable as qualified for meeting project objective. As such, the completeness for the samples analyzed is 100%, which satisfies the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations, drilling and installation procedures and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the surface water and sediment samples. The close agreement between the field duplicate results is considered to indicate that the samples collected are adequately representative of the medium sampled. Laboratory duplicates were used to evaluate how representative an aliquot taken from a sample is of a given sample. As noted in Section 6.1, the laboratory duplicate results satisfied the precision evaluation indicating that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

All RLs obtained met the QAPP specified RL requirements for aqueous media for which there was screening level criteria provided in the QAPP or the Baseline Ecological Risk Assessment to which RLs for nondetect analytes could be compared.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT306

Sampling Events: Rinsate Blanks for the Benthic Survey and GSI Studies

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike

Date Completed: 11/04/04

Peer Reviewer: Stacey Coker

Date Completed: 12/03/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals[2]	Inorganics
RB01T-SED (09/25/04)	SA	588449		W	X	X
RB02T-SED (09/25/04)	SA	588450		W	X	
RB03T-SED (09/25/04)	SA	588451		W	X	X
RB04T-SED (09/26/04)	SA	588452		W	X	
RB05T-SED (09/26/04)	SA	588453		W	X	X
RB06T-SED (09/26/04)	SA	588454		W	X	
RB02T-SFW (10/01/04)	SA	589914		W	X	X
RB02D-SFW (10/01/04)	SA	589915		W	X	X[3]
RB02T-SED (10/01/04)	SA	589916	RB02T-SED-1001	W	X	X

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Total metals includes Aluminum and Iron only.

[3]For sample RB02D-SFW, only dissolved organic carbon was analyzed.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	Two samples were received with the sample ID RB02T-SED, but with different collection dates. Due to the limitation of the metals reporting system that does not allow for the reporting of samples with identical Ids, it was necessary to add a date suffix to the ID (RB02T-SED-1001) for the sample collected 10/01/04.
Holding Times	No	Several samples in this SDG were received 1-2-days past holding time for the nitrite and orthophosphate analyses. Table 1 summarizes the samples that exceeded holding time and the resultant data qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • LD	N/A	Matrix QC samples were not analyzed with this SDG. The matrix quality control results for the September 2004 Benthic Survey and GSI Groundwater/ Surface Water Interaction Study Sampling Events will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RB01T-SED • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analysis was run on sample RB01T-SED. Because this sample is a rinsate blank, the serial dilution results are not considered applicable with respect to the site-specific sample matrix. Therefore, the serial dilution results were not evaluated for this sample. The serial dilution results for the September 2004 Benthic Survey and GSI Groundwater/ Surface Water Interaction Study Sampling Events will be evaluated collectively and any additional data qualification will be summarized in the associated overall assessment for water samples.
Field QC • Field Duplicate • Rinsate Blank RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	N/A	Field duplicates samples were not included in this SDG. The field QC results for the September 2004 Benthic Survey and GSI Groundwater/ Surface Water Interaction Study Sampling Events will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The rinsate blank detections will be assessed collectively with all other rinsate blank results to determine the need for qualification.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the Benthic Survey Study.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Holding Time Qualifications for Inorganics

Sample	Nitrite (mg/L)	Orthophosphate (mg/L)
RB01T-SED (09/25/04)	0.0050 UJ	0.010 UJ
RB02T-SED (09/25/04)	0.0050 UJ	0.010 UJ
RB03T-SED (09/25/04)	0.0050 UJ	0.010 UJ
RB02T-SFW (10/01/04)	0.0050 UJ	0.010 UJ
RB02T-SED (10/01/04)	0.0050 UJ	0.010 UJ

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	0.6	0.7	0.7	---	0.30	RB01T-SED	U CCB-I
Arsenic	-0.1	-0.1	-0.1	---	0.10	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB-L
Cadmium	-0.2	-0.2	-0.2	-0.161	0.10	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB, MB-L

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Copper	-1.2	-1.2	-1.2	-0.896	0.30	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB, MB-L
Molybdenum	0.6	---	---	---	0.40	RB01T-SED (09/25/04)	U CCB-I
Nickel	-1.4	-1.5	-1.5	-1.353	0.30	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB, MB-L
Silver	-0.1	-0.1	-0.1	-0.107	0.10	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB, MB-L
Sodium	---	---	---	378.5	357.9	RB01T-SED (09/25/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	U MB-I
Vanadium	-0.3	-0.3	-0.3	-0.341	0.10	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB, MB-L
Zinc	-5.3	-5.4	-5.4	-3.247	1.9	RB01T-SED (09/25/04) RB02D-SFW (10/01/04) RB02T-SED (09/25/04) RB02T-SED (10/01/04) RB03T-SED (09/25/04) RB04T-SED (09/26/04) RB05T-SED (09/26/04) RB06T-SED (09/26/04)	UJ CCB, MB-L

CCBx = Continuing Calibration Blank RL = Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT308

Sampling Events: GSI Groundwater/Surface Water Interaction Study

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike

Date Completed: 11/04/04

Peer Reviewer: Stacey Coker

Date Completed: 12/02/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics
RR-13A-T00N-SFW	SA	588694		W	X[2]	X
RR-13A-D00N-SFW	SA	588695		W	X	X[3]
RR-13B-T00N-SFW	SA	588696		W	X[2]	X
RR-13B-D00N-SFW	SA	588697		W	X	X[3]
RR-11B2-T00N-SFW	SA	588698		W	X[2]	X
RR-11B2-D00N-SFW	SA	588699		W	X	X[3]
RR-11B3-T00N-SFW	SA	588700		W	X[2]	X
RR-11B3-D00N-SFW	SA	588701		W	X	X[3]
RR-5BB-T00N-SFW	SA, MS, MSD, LD	588702		W	X[2]	X
RR-5BB-D00N-SFW	SA, MS, MSD, LD	588703		W	X	X[3]
ZWERGLE-T00N-SFW	SA	588704		W	X[2]	X
ZWERGLE-D00N-SFW	SA	588705		W	X	X[3]
ZWERGLE-T00D-SFW	FD	588706		W	X[2]	X
ZWERGLE-D00D-SFW	FD	588707		W	X	X[3]

Matrix: W = Water FD = Field Duplicate

QC Type: SA = Sample MS = Matrix Spike LD = Laboratory Duplicate

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Total metals includes Aluminum and Iron only

[3] "D00N" samples were analyzed for only dissolved organic carbon (DOC).

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The field IDs were entered on the COC with a matrix code of "GRW" instead of "SFW" as on the sample labels. The laboratory logged the samples in according to the field ID on the sample labels, which contained the proper matrix code.
Holding Times	Yes	
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1.1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD RR-5BB-T00N-SFWS RR-5BB-T00N-SFWS • LD RR-5BB-T00N-SFWD RR-5BB-T00N-SFWD	No	All matrix QC sample results were within evaluation criteria except for chloride and TOC in sample RR-5BB-T00N-SFW. Table 1.2 summarizes the outlying results and resultant data qualifications. The matrix quality control results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-5BB-T00N-SFWSL RR-5BB-D00N-SFWSL • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses run on the matrix spikes of samples RR-5BB-T00N-SFW and RR-5BB-D00N-SFW. For sample RR-5BB-T00N-SFW, the serial dilution results were applicable for both analytes. For sample RR-5BB-D00N-SFW, the serial dilution results were only applicable for 21 of the 24 analytes. Serial dilution results for some of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. The selenium and arsenic results were outside criteria for sample RR-5BB-D00N-SFW. Table 1.3 summarizes the outlying results and resultant data qualification. The serial dilution results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5, with the exception of ZWERGLE-T00D-SFW (1.67). The TDS result for sample ZWERGLE-T00D-SFW was qualified as estimated (J TvP-L). Recovery of the internal standard Sc was high for the ICPMS analysis of samples RR-11B3-D00N-SFW, RR-5BB-D00N-SFW, ZWERGLE-D00N-SFW, and ZWERGLE-D00D-SFW. Therefore, selenium and vanadium results for these samples were qualified as estimated (UJ IS-I).
Field QC • Field Duplicate ZWERGLE-T00N-SFW/ ZWERGLE-T00D-SFW ZWERGLE-D00N-SFW/ ZWERGLE-D00D-SFW • Rinsate Blank	No	All field duplicate results were within evaluation criteria except for TDS in samples ZWERGLE-T00N-SFW and ZWERGLE-T00D-SFW. Table 1.4 summarizes the outlying results and the resultant data qualifications. The field QC results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the GSI Groundwater Surface Water Interaction Study.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: ▪ Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. ▪ All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1.1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	0.6	0.6	---	0.6	---	0.3	ZWERGLE-D00N-SFW	U CCB-I
Arsenic	-0.1	-0.1	-0.1	-0.2	---	0.1	RR-11B2-D00N-SFW RR-11B3-D00N-SFW RR-13A-D00N-SFW RR-13B-D00N-SFW RR-5BB-D00N-SFW ZWERGLE-D00D-SFW ZWERGLE-D00N-SFW	UJ CCB-L
Cadmium	-0.2	-0.2	-0.2	-0.2	-0.161	01	RR-11B2-D00N-SFW RR-11B3-D00N-SFW RR-13A-D00N-SFW RR-13B-D00N-SFW RR-5BB-D00N-SFW ZWERGLE-D00D-SFW ZWERGLE-D00N-SFW	UJ CCB, MB-L
Copper	-1.2	-1.2	-1.2	-1.2	-0.896	0.3	RR-11B2-D00N-SFW RR-11B3-D00N-SFW RR-13A-D00N-SFW RR-13B-D00N-SFW RR-5BB-D00N-SFW ZWERGLE-D00D-SFW ZWERGLE-D00N-SFW	J/UJ CCB, MB-L
Mercury	---	---	---	-0.1	---	0.1	RR-5BB-D00N-SFW ZWERGLE-D00D-SFW ZWERGLE-D00N-SFW	UJ CCB-L
Nickel	-1.4	-1.5	-1.5	-1.4	-1.353	0.3	RR-5BB-D00N-SFW ZWERGLE-D00D-SFW ZWERGLE-D00N-SFW	J/UJ CCB, MB-L
Silver	-0.1	-0.1	-0.1	-0.1	-0.107	0.1	RR-11B-D00N-SFW RR-11B3-D00N-SFW RR-13A-D00N-SFW RR-13B-D00N-SFW RR-5BB-D00N-SFW ZWERGLE-D00D-SFW ZWERGLE-D00N-SFW	UJ CCB, MB-L
Vanadium	-0.3	-0.3	-0.3	-0.3	-0.341	0.1	RR-11B-D00N-SFW RR-11B3-D00N-SFW RR-13A-D00N-SFW RR-13B-D00N-SFW RR-5BB-D00N-SFW ZWERGLE-D00D-SFW ZWERGLE-D00N-SFW	UJ CCB, MB-L
Zinc	----	---	---	---	3.627	1.9	RR-5BB-D00N-SFW ZWERGLE-D00D-SFW ZWERGLE-D00N-SFW	U MB-I

CCBx = Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 1.2
Matrix Spike Results
and Parent Sample Qualifications

Analyte	MS%R	PDS %R	Criteria	Parent Sample Qualification
RR-5BB-T00N-SFW				
Chloride	147	N/A	75-125	J MS-H
Nitrate/Nitrite	68	N/S		J ML-L
TOC	130	N/A		ND (NQ)

N/A = Not appropriate ND (NQ) = No Qualification due to nondetect result with high bias.

Table 1.3
Serial Dilutions Resulting in
Parent Sample Qualifications

Analyte	Sample Result (ug/L)	Serial Dilution Result (ug/L)	%D	Qualification
RR-5BB-D00N-SFW				
Arsenic	18.57	21.47	15.6	UJ DL-L
Selenium	15.48	18.29	18.2	UJ DL-L

Table 1.4
Field Duplicates Concentrations and Data Qualifications

Analyte	ZWERGLE-T00N-SFW	ZWERGLE-T00N-SFW	Outside Criteria	RL mg/L	Action
TSS	0.6	1.7	AD= 2.2X RL	0.5	J FD-I parent sample and duplicate

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT309

Sampling Events: GSI Groundwater/Surface Water Interaction Study

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike

Date Completed: 10/25/04

Peer Reviewer: Stacey Coker

Date Completed: 11/01/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics[2]
RR-13A-T00N-PS	SA	588708		W		X
RR-13A-D00N-PS	SA	588709		W	X	X
RR-13B-T00N-PS	SA	588710		W		X
RR-13B-D00N-PS	SA	588711		W	X	X
RR-13A-T00N-WSC	SA	588712		W		X
RR-13A-D00N-WSC	SA	588713		W	X	X
RR-13B-T00N-WSC	SA	588714		W		X
RR-13B-D00N-WSC	SA	588715		W	X	X
RR-11B2-T00N-PS	SA	588716		W		X
RR-11B2-D00N-PS	SA	588717		W	X	X
RR-11B3-T00N-PS	SA	588718		W		X
RR-11B3-D00N-PS	SA	588719		W	X	X
RR-11B2-T00N-WSC	SA	588720		W		X
RR-11B2-D00N-WSC	SA	588721		W	X	X
RR-11B3-T00N-WSC	SA	588722		W		X
RR-11B3-D00N-WSC	SA	588723		W	X	X
RR-5BB-T00N-PS	SA	588724		W		X
RR-5BB-D00N-PS	SA	588725		W	X	X
RR-5BB-T00N-WSC	SA	588726		W		X
RR-5BB-D00N-WSC	SA	588727		W	X	X
ZWERGLE-T00N-PS	SA	588728		W		X
ZWERGLE-D00N-PS	SA	588729		W	X	X
ZWERGLE-T00N-WSC	SA	588730		W		X
ZWERGLE-D00N-WSC	SA	588731		W	X	X

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]For "D00N" samples only dissolved organic carbon was analyzed.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Sample ZWERGLE-T00N-WSC was not analyzed for fluoride, as all the sample volume was inadvertently consumed during the sulfate analysis before the fluoride analysis could be accomplished. No qualifications of data were necessary.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • LD	N/A	Matrix QC samples were not analyzed with this SDG. The matrix quality control results for the September 2004 GSI Groundwater/Surface Water Interaction Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-13A-D00N-PS • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses run on sample RR-13A-D00N-PS. The serial dilution results were applicable for both analytes. For sample RR-13A-D00N-PS, the serial dilution results were only applicable for 9 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. Table 2 summarizes the outlying results and the resultant data qualifications. The serial dilution results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The data package does not include the ion balance spreadsheet normally provided for the water samples. This is due to the fact that all the constituents in the calculation were not analyzed in this delivery group.
Field QC • Field Duplicate • Rinsate Blank	N/A	Field QC samples were not analyzed with this SDG. The field QC results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the GSI Groundwater Surface Water Interaction Study.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: ▪ Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. ▪ All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	1.8	1.8	1.8	1.8	---	---	1.495		RR-11B2-D00N-PS RR-11B2-D00N-WSC RR-11B3-D00N-PS RR-11B3-D00N-WSC RR-13A-D00N-PS RR-13A-D00N-WSC RR-13B-D00N-PS RR-13B-D00N-WSC RR-5BB-D00N-PS RR-5BB-D00N-WSC ZWERGLE-D00N-PS ZWERGLE-D00N-WSC	U CCB, MB-I
Nickel	-0.6	-0.7	-0.6	-0.6	---	---	-0.541		ZWERGLE-D00N-PS ZWERGLE-D00N-WSC	J/ UJ CCB, MB-L
Molybdenum	0.8	0.6	0.6	0.6	0.6	0.6	0.723		RR-11B2-D00N-WSC RR-11B3-DOON-WSC RR-13A-D00N-WSC RR-13B-D00N-WSC RR-5BB-S00N-PS RR-5BB-D00N-WSC ZWERGLE-D00N-PS ZWERGLE-D00N-WSC	U CCB, MB-I
									RR-13B-D00N-PS	U MB-I
Iron	---	---	50.0	---	---	---	---		RR-5BB-D00N-PS RR-5BB-D00N-WSC ZWERGLE-D00N-PS	U CCB-I
Zinc	---	---	---	---	---	---	2.560		ZWERGLE-D00N-WSC	U MB-I

CCBx = Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 2
Serial Dilutions Resulting in
Parent Sample Qualifications

Analyte	Sample Result (ug/L)	Serial Dilution Result (ug/L)	%D	Qualification
RR-13A-D00N-PS				
Cadmium	8.16	9.11	11.6	J DL-L

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT311

Sampling Events: GSI Groundwater/Surface Water Interaction Study

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike

Date Completed: 10/27/04

Peer Reviewer: Stacey Coker

Date Completed: 11/01/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals[2]	Inorganics[3]
RR-13A-T01N-SFW	SA	589071		W	X[2]	X
RR-13A-D01N-SFW	SA	589072		W	X	X[3]
RR-13B-T01N-SFW	SA	589073		W	X[2]	X
RR-13B-D01N-SFW	SA	589074		W	X	X[3]
RR-5BB-T01N-SFW	SA	589075		W	X[2]	X
RR-5BB-D01N-SFW	SA	589076		W	X	X[3]
RR-5BB-T01D-SFW	FD	589077		W	X[2]	X
RR-5BB-D01D-SFW	FD	589078		W	X	X[3]
RR-11B2-T01N-SFW	SA, MS, LD	589079		W	X[2]	X
RR-11B2-D01N-SFW	SA, MS, LD	589080		W	X	X[3]
ZWERGLE-T01N-SFW	SA	589081		W	X[2]	X
ZWERGLE-D01N-SFW	SA	589082		W	X	X[3]
RR-11B3-T01N-SFW	SA	589083		W	X[2]	X
RR-11B3-D01N-SFW	SA	089084		W	X	X[3]

Matrix: W = Water FD = Field Duplicate
QC Type: SA = Sample LD = Laboratory Duplicate MS = Matrix Spike
[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.
[2]Total metals includes Aluminum and Iron only
[3]For "D01N" samples only dissolved organic carbon was analyzed.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The original orthophosphate analyses for all samples were accomplished within the holding time limit. However, during the laboratory data review process it was discovered that the results for several samples were significantly higher than expected. The samples were re-analyzed 20 days beyond holding time yielding acceptable results. Table 1 lists the samples that were analyzed outside holding time and the resultant data qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD RR-11B2-T01N-SFW RR-11B2-D01N-SFW • LD RR-11B2-T01N-SFW RR-11B2-D01N-SFW	Yes	All matrix QC results were within evaluation criteria, therefore, no qualifications of date were necessary. The matrix quality control results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-11B2-T01N-SFW RR-11B2-D01N-SFW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses run on samples RR-11B2-T01N-SFW and RR-11B2-D01N-SFW. For sample RR-11B2-T01N-SFW, the serial dilution results were applicable for both analytes. For sample RR-11B2-D01N-SFW, the serial dilution results were only applicable for 21 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. Table 3 summarizes the outlying results and the resultant data qualifications. The serial dilution results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. Several sample results were outside criteria for the total vs. partial analysis of total organic carbon and dissolved organic carbon. Table 4 summarizes the outlying results and the resultant data qualifications. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5 with the exception of ZWERGLE-T01N-SFW. The TDS ratio reported for this sample was 1.62. The TDS result for sample ZWERGLE-T01N-SFW was qualified as estimated (J TVP-L).
Field QC • Field Duplicate RR-5BB-T01N-SFW RR-5BB-D01N-SFW • Rinsate Blank	No	All field duplicate results were within evaluation criteria except for TSS. Table 5 summarizes the outlying %RPD and the resultant data qualification. The field QC results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the GSI Groundwater Surface Water Interaction Study.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: ▪ Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. ▪ All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Holding Time Qualifications for Inorganics

Sample	Orthophosphate (mg/L)
RR-13B-T01N-SFW	0.10 UJ
RR-5BB-T01N-SFW	0.10 UJ
RR-5BB-T01D-SFW	0.10 UJ
RR11B2-T01N-SFW	0.10 UJ

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	1.8 (CCB5)	1.8 (CCB6)	1.8 (CCB7)	---		0.30	RR-11B2-D01N-SFW RR-11B3-D01N-SFW RR-13A-D01N-SFW RR-13B-D01N-SFW RR-5BB-D01D-SFW RR-5BB-D01N-SFW ZWERGLE-D01N-SFW	U CCB, MB-I
Beryllium	---	---	0.4	0.5	---	0.30	RR-11B3-D01N-SFW ZWERGLE-D01N-SFW	U CCB-I
Cadmium	-0.1	---	---	---	-0.107	0.10	RR-11B-D01N-SFW RR-11B3-D01N-SFW RR-13A-D01N-SFW RR-13B-D01N-SFW RR-5BB-D01D-SFW RR-5BB-D01N-SFW ZWERGLE-D01N-SFW	J/ UJ MB-L
Chromium	-5.4	-6.3	-5.9	-5.1	-5.086	1.1	RR-11B-D01N-SFW RR-11B3-D01N-SFW RR-13A-D01N-SFW RR-13B-D01N-SFW RR-5BB-D01D-SFW RR-5BB-D01N-SFW ZWERGLE-D01N-SFW	UJ CCB, MB-L
Iron	-56.3	-67.3	-62.4	---	-39.110	35.5	RR-11B-D01N-SFW RR-11B3-D01N-SFW RR-13A-D01N-SFW RR-13B-D01N-SFW RR-5BB-D01D-SFW RR-5BB-D01N-SFW ZWERGLE-D01N-SFW	UJ CCB, MB-L
Nickel	-0.6 (CCB5)	-0.6 (CCB6)	-0.6 (CCB7)	---	-0.564	0.30	ZWERGLE-D01N-SFW	J CCB, MB-L
Molybdenum	0.7 (CCB5)	0.7 (CCB6)	0.7 (CCB7)	---	0.643	0.40	RR-11B-D01N-SFW RR-11B3-D01N-SFW RR-13A-D01N-SFW RR-13B-D01N-SFW RR-5BB-D01D-SFW RR-5BB-D01N-SFW ZWERGLE-D01N-SFW	U CCB, MB-I
Potassium	---	656.5	---	---	---	484.3	RR-11B-D01N-SFW RR-11B3-D01N-SFW RR-13A-D01N-SFW RR-13B-D01N-SFW RR-5BB-D01D-SFW RR-5BB-D01N-SFW ZWERGLE-D01N-SFW	U CCB-I

CCBx = Continuing Calibration Blank RL= Reporting Limit IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 3
Serial Dilutions Resulting in
Parent Sample Qualifications

Analyte	Sample Result (ug/L)	Serial Dilution Result (ug/L)	%D	Qualification
RR-11B2-D01N-SFW				
Selenium	17.49	19.56	11.8	UJ DL-L

Table 4
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	%RPD or Absolute Difference	RL	Evaluation Criteria	Action
Total Organic Carbon vs Dissolved Organic Carbon				
RR-13A-T01N-SFW/ RR-13A-D01N-SFW	AD= 5.9X RL	1.0	AD= <2 X RL	J TVP for parent samples
RR-13B-T01N-SFW/ RR-13B-D01N-SFW	AD= 9.0 X RL	1.0	AD= <2 X RL	J TVP for parent samples
RR-11B3-T01N-SFW/ RR-11B3-D01N-SFW	AD= 3.8 X RL	1.0	AD= <2 X RL	J TVP for parent samples

Table 5
Field Duplicates Concentrations and Data Qualifications

Analyte	RR-5BB-T01N-SFW	RR-5BB-T01D-SFW	Criteria Comment	Outside Criteria	RL	Action
TSS	6.3	3.5	RPD<30%	RPD= 57.1%	0.5	J FD-I parent sample and duplicate

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT312

Sampling Events: GSI Groundwater/Surface Water Interaction Study

Matrix: Solid ___ Water X Biota ___

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike

Date Completed: 10/27/04

Peer Reviewer: Stacey Coker

Date Completed: 11/01/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals[2]	Inorganics[3,4]
RR-13A-T01N-PS	SA	589202		W		X
RR-13A-D01N-PS	SA	589203		W	X	X
RR-13B-T01N-PS	SA	589204		W		X
RR-13B-D01N-PS	SA	589205		W	X	X
RR-13A-T01N-WSC	SA	589206		W		X
RR-13A-D01N-WSC	SA	589207		W	X	X
RR-13B-T01N-WSC	SA	589208		W		X
RR-13B-D01N-WSC	SA	589209		W	X	X
RR-5BB-T01N-PS	SA	589210		W		X
RR-5BB-D01N-PS	SA	589211		W	X	X
RR-5BB-T01N-WSC	SA	589212		W		X
RR-5BB-D01N-WSC	SA	589213		W	X	X
RR-11B2-T01N-PS	SA	589214		W		X
RR-11B2-D01N-PS	SA	589215		W	X	X
RR-11B2-T01N-WSC	SA	589216		W		X
RR-11B2-D01N-WSC	SA	589217		W	X	X
ZWERGLE-T01N-PS	SA	589218		W		X
ZWERGLE-D01N-PS	SA	589219		W	X	X
RR-11B3-T01N-PS	SA	589220		W		X
RR-11B3-D01N-PS	SA	589221		W	X	X
ZWERGLE-T01N-WSC	SA	589222		W		X
ZWERGLE-D01N-WSC	SA	589223		W	X	X
RR-11B3-T01N-WSC	SA	589224		W		X
RR-11B3-D01N-WSC	SA	589225		W	X	X

Matrix: W = Water FD = Field Duplicate

QC Type: SA = Sample LD = Laboratory Duplicate MS = Matrix Spike

[1] The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2] Dissolved metals only.

[3] Reduced analyte list due to limited sample volume.

[4] "D01N" samples were only analyzed for dissolved organic carbon (DOC).

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • LD	Yes	Matrix QC samples were not analyzed with this SDG. The matrix quality control results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-13A-D01N-PS • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses run on sample RR-13A-D01N-PS The serial dilution results were only applicable for 9 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. Table 2 summarizes the outlying results and the resultant data qualifications. The serial dilution results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The data package does not include the ion balance spreadsheet normally provided for the water samples. This is due to the fact that some of the constituents in the calculation were not required analytical parameters. One result was outside criteria for the total vs. partial analysis of total organic carbon and dissolved organic carbon. Table 3 summarizes the outlying results and the resultant data qualifications.
Field QC • Field Duplicate • Rinsate Blank	N/A	Field QC was not analyzed with this SDG. The field QC results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the GSI Groundwater Surface Water Interaction Study.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	1.1	1.0	1.0	1.0	---		RR-11B2-D01N-PS RR-11B2-D01N-WSC RR-13A-D01N-PS RR-13A-D01N-WSC RR-13B-D01N-PS ZWERGLE-D01N-PS	U CCB-I
Arsenic	---	---	---	---	0.122		RR-11B2-D01N-PS RR-11B2-D01N-WSC RR-11B3-D01N-PS RR-11B3-D01N-WSC RR-13A-D01N-PS RR-13A-D01N-WSC RR-13B-D01N-PS RR-13B-D01N-WSC RR-5BB-D01N-PS RR-5BB-D01N-WSC ZWERGLE-D01N-PS ZWERGLE-D01N-WSC	UJ MB-L
Beryllium	---	0.4	---	---	---		RR-13B-D01N-WSC	U CCB-I
Cadmium	-0.2	-0.2	-0.2	-0.2	-0.154		RR-11B2-D01N-PS RR-11B2-D01N-WSC RR-11B3-D01N-PS RR-11B3-D01N-WSC RR-13A-D01N-WSC RR-13B-D01N-WSC RR-5BB-D01N-WSC ZWERGLE-D01N-PS ZWERGLE-D01N-WSC	J/UJ CCB, MB-L

Table 1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Copper	-1.3	-1.3	-1.3	-1.3	-0890		RR-11B2-D01N-PS RR-11B2-D01N-WSC RR-11B3-D01N-PS RR-11B3-D01N-WSC RR-13A-D01N-WSC RR-13B-D01N-WSC RR-5BB-D01N-WSC ZWERGLE-D01N-PS ZWERGLE-D01N-WSC	U/UJ CCB, MB-L
Iron	---	---	47.8	---	---		RR-5BB-D01N-PS	U CCB-I
Nickel	-1.1	-1.1	-1.1	-1.1	-0.991		ZWERGLE-D01N-PS ZWERGLE-D01N-WSC	UJ CCB, MB-L
Selenium	---	-0.3	---	---	---		RR-13A-D01N-WSC RR-13B-D01N-PS RR-13B-D01N-WSC RR-5BB-D01N-PS RR-5BB-D01N-WSC	J/ UJ CCB-L
Silver	-0.1	-0.1	-0.2	-0.1	-0.152		RR-11B2-D01N-PS RR-11B2-D01N-WSC RR-11B3-D01N-PS RR-11B3-D01N-WSC RR-13A-D01N-PS RR-13A-D01N-WSC RR-13B-D01N-PS RR-13B-D01N-WSC RR-5BB-D01N-PS RR-5BB-D01N-WSC ZWERGLE-D01N-PS ZWERGLE-D01N-WSC	UJ CCB, MB-L
Vanadium	-0.3	-0.2	-0.3	-0.2	-0.196		RR-11B2-D01N-PS RR-11B2-D01N-WSC RR-11B3-D01N-PS RR-11B3-D01N-WSC RR-13A-D01N-PS RR-13A-D01N-WSC RR-13B-D01N-PS RR-13B-D01N-WSC RR-5BB-D01N-PS RR-5BB-D01N-WSC ZWERGLE-D01N-PS ZWERGLE-D01N-WSC	J/ UJ CCB,MB-L

CCBx = Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 2
Serial Dilutions Resulting in
Parent Sample Qualifications

Analyte	Sample Result (ug/L)	Serial Dilution Result (ug/L)	%D	Qualification
RR-13A-D01N-PS				
Zinc	1187	1310	10.4	None, sample result rounds to 10%

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT313

Sampling Events: GSI Groundwater/Surface Water Interaction Study

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike

Date Completed: 10/31/04

Peer Reviewer: Stacey Coker

Date Completed: 12/11/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals[2]	Inorganics
RB01T-SFW	SA	589349		W	X	X
RB01D-SFW	SA	589350		W	X	X[3]
BCS-SEEP-T01N-GRW	SA	589351		W	X	X
BCS-SEEP-D01N-GRW	SA	589352		W	X	
RR-13A-T02N-SFW	SA	589353		W	X	X
RR-13A-D02N-SFW	SA	589354		W	X	X[3]
RR-13B-T02N-SFW	SA	589355		W	X	X
RR-13B-D02N-SFW	SA	589356		W	X	X[3]
RR-11B2-T02N-SFW	SA	589357		W	X	X
RR-11B2-D02N-SFW	SA	589358		W	X	X[3]
RR-11B3-T02N-SFW	SA	589359		W	X	X
RR-11B3-D02N-SFW	SA	589360		W	X	X[3]
ZWERGLE-T02N-SFW	SA	589361		W	X	X
ZWERGLE-D02N-SFW	SA	589362		W	X	X[3]
RR-5BB-T02N-SFW	SA	589363		W	X	X
RR-5BB-D02N-SFW	SA	589382		W	X	X[3]

Matrix: W = Water BCS = Bitter Creek Scar LD = Laboratory Duplicate
QC Type: SA = Sample FD = Field Duplicate MS = Matrix Spike

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Total metals includes Aluminum and Iron only.

[3]Only dissolved organic carbon (DOC)was requested and analyzed.

[4]BCS is Bitter Creek Seep.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

During the total phosphorus analysis of sample BCS-SEEP-T01N-GRW, the analyst observed that the sample turned brown after the digestion process and yellow upon addition of the colorizing reagent. The laboratory suspects interference related to the sample matrix caused the color change. The total phosphorus result for this sample was qualified as estimated **(J I-I)**.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The original TDS analysis for sample BCS-SEEP-T01N-GRW, which was analyzed within holding time, yielded a net dry weight that greatly exceeded the upper limit of the method. The sample was re-analyzed using a smaller volume outside of holding time yielding results comparable to the original analysis. The results from the re-analysis were presented in this SDG. Sample BCS-SEEP-T01N-GRW was received 1 day beyond holding time for the nitrite and Orthophosphate analyses. The sample was analyzed on the day it was received. The original orthophosphate analyses for all samples, except for BCS-SEEP-GRW, were accomplished within holding time. However, during the data review process it was discovered that the results for samples BCS-SEEP-T01N-GRW, RR-11B3-T02N-SFW, and ZWERGLE-T02N-SFW were significantly higher than expected based on the total phosphorus results obtained. These samples were re-analyzed 19-20 days beyond holding time yielding acceptable results. Table 1 lists the samples and analyses that exceeded holding time and the resultant data qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • LD	N/A	Matrix QC samples were not analyzed with this SDG. The matrix quality control results for the September 2004 GSI Groundwater/ Surface water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RB01D-SFW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses run on sample RB01D-SFW. Since this sample is a rinsate blank, it is not an appropriate matrix for the serial dilution test which aims to identify potential interferences. No qualifications of data were necessary. The serial dilution results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within the acceptance range of 0.5 and 1.5. Several results were outside criteria for the total vs. partial analysis of total organic carbon and dissolved organic carbon. Table 3 summarizes the outlying results and the resultant data qualifications.

Review Parameter	Criteria Met?	Comments
Field QC • Field Duplicate • Rinsate Blank • RB01T-SFW • RB01D-SFW	N/A	Field duplicates samples were not included in this SDG. The rinsate blank detections will be assessed collectively with all other rinsate blank results to determine the need for qualification. The field QC results for the September 2004 GSI Groundwater/ Surface water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However the dilution scheme used routinely for the RI/FS was modified slightly for the GSI Groundwater/ Surface Water Interaction Study.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Holding Time Qualifications for Inorganics

Sample	TDS (mg/L)	Nitrite (mg/L)	Orthophosphate (mg/L)
BCS-SEEP-T01N-GRW	16700 J	0.59 J	0.49 J
RR-11B3-T02N-SFW	---	---	0.010 UJ
ZWERGLE-T02N-SFW	---	---	0.010 UJ

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum	---	34.8	---	---	34.1	RR-11B2-D02N-SFW RR-11B3-D02N-SFW RR-5BB-D02N-SFW	U CCB-I
Antimony	1.5	1.3	1.3	1.011	0.30	RB01D-SFW RR-11B2-D01N-SFW RR-11B3-D02N-SFW RR-13A-D02N-SFW RR-13B-D02N-SFW RR-5BB-D02N-SFW ZWERGLE-D02N-SFW	U CCB, MB-I
Chromium	1.4	1.3	-1.7	---	1.1	RR-5BB-D02N-SFW ZWERGLE-D02N-SFW	UJ CCB-L
						RB01D-SFW	U CCB-I
Copper	-1.5	-1.5	-1.4	-0.701	0.30	RB01D-SFW RR-11B3-D02N-SFW RR-13A-D02N-SFW RR-13B-D02N-SFW ZWERGLE-D02N-SFW	J/UJ CCB, MB-L
						RR-11B2-D02N-SFW RR-5BB-D02N-SFW	J CCB-L
Molybdenum	0.8	---	---	---	0.40	RR-11B3-D02N-SFW RR-13B-D02N-SFW	U CCB-I
Nickel	-1.4	-1.4	-1.4	-1.304	0.30	RR01D-SFW RR-5BB-D02N-SFW ZWERGLE-D02N-SFW	UJ CCB, MB-L
Selenium	-0.3	--	---	-0.419	0.30	RB01D-SFW RR-11B2-D02N-SFW RR-11B3-D02N-SFW RR-13A-D02N-SFW RR-13B-D02N-SFW ZWERGLE-D02N-SFW	UJ CCB, MB-L
						RR-5BB-D02N-SFW	UJ MB-L
Silver	-0.1	-0.1	-0.1	-0.129	0.10	BCS-SEEP-D01N-GRW RB01D -SFW RR-11B2-D02N-SFW RR-11B3-D02N-SFW RR-13A-D02N-SFW RR-13B-D02N-SFW	UJ CCB, MB-I
Sodium	-571.0	-481.9	-781.1	---		BCS-SEEP-D01N-GRW RB01D-SFW ZWERGLE-D02N-SFW	J/ UJ CCB-L

CCBx = Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

Note: The IDL was used as the RL.

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 3
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	%RPD or AD	RL	Applicable Evaluation Criteria	Action
Orthophosphate vs Phosphorus				
BCS-SEEP-T01N-GRW	132%	0.01	RPD <30%	J TVP-I for affected sample (s).
RR-13B-T02N-SFW	144%	0.01	RPD <30%	J TVP-I for affected sample (s).
Total Organic Carbon vs Dissolved Organic Carbon				
RR-13A-T02N-SFW/ RR-13A-D02N-SFW	AD=6.0 x RL	1.0	AD< 2x RL	J TVP-I for affected sample (s).
RR-13B-T02N-SFW/ RR-13B-D02N-SFW	AD= 8.3 x RL	1.0	AD< 2x RL	J TVP-I for affected sample (s).
RR-11B2-T02N-SFW/ RR-11B2-D02N-SFW	AD= 7.0 x RL	1.0	AD< 2x RL	J TVP-I for affected sample (s).

AD = Absolute Difference

RL = Reporting Limit

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT315

Sampling Events: GSI Groundwater/Surface Water Interaction Study

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike

Date Completed: 11/23/04

Peer Reviewer: Stacey Coker

Date Completed: 12/11/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics[2]
ZWERGLE-T02N-PS	SA	589402		W		X
ZWERGLE-D02N-PS	SA	589403		W	X	X
RR-5BB-T02N-PS	SA	589404		W		X
RR-5BB-D02N-PS	SA	589405		W	X	X
ZWERGLE-T02N-WSC	SA	589406		W		X[3]
ZWERGLE-D02N-WSC	SA	589407		W	X	X
RR-5BB-T02N-WSC	SA	589408		W		X[3]
RR-5BB-D02N-WSC	SA	589409		W	X	X
RR-13A-T02N-PS	SA	589410		W		X
RR-13A-D02N-PS	SA	589411		W	X	X
RR-13B-T02N-PS	SA	589412		W		X
RR-13B-D02N-PS	SA	589413		W	X	X
RR-13A-T02N-WSC	SA	589414		W		X[3]
RR-13A-D02N-WSC	SA	589415		W	X	X
RR-13B-T02N-WSC	SA	589416		W		X[3]
RR-13B-D02N-WSC	SA	589417		W	X	X
RR-11B2-T02N-PS	SA	589418		W		X
RR-11B2-D02N-PS	SA	589419		W	X	X
RR-11B3-T02N-PS	SA	589420		W		X
RR-11B3-D02N-PS	SA	589421		W	X	X
RR-11B2-T02N-WSC	SA	589422		W		X[3]
RR-11B2-D02N-WSC	SA	589423		W	X	X
RR-11B3-T02N-WSC	SA	589424		W		X[3]
RR-11B3-D02N-WSC	SA	589425		W	X	X

Matrix: W = Water PS = Piezometer Composite Sample WSC = Within Sediment Camber and Composite Symbol

QC Type: SA = Sample LD = Laboratory Duplicate MS = Matrix Spike

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Limited inorganics: fluoride, sulfate, TOC and Alkalinity.

[3]Inorganics limited to fluoride, sulfate and TOC.

[4]For "D02N" samples, only dissolved organic carbon (DOC) was requested and analyzed.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • LD	N/A	Matrix QC samples were not analyzed with this SDG. The matrix quality control results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution ZWERGLE-D02N-PS • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analysis run on sample ZWERGLE-D02N-PS. The serial dilution results were applicable for 2 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. Since both % differences were < 10%, no qualifications of data were necessary. The serial dilution results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The data package does not include the ion balance spreadsheet normally provided for the water samples. This is due to the fact that some of the constituents in the calculation were not required analytical parameters for this study.
Field QC • Field Duplicate • Rinsate Blank	N/A	Field QC samples were not analyzed with this SDG. The field QC results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the GSI Groundwater Surface Water Interaction Study.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum	39.8	---	---	---	---	---		RR-13A-D02N-WSC ZWERGLE-D02N-PS ZWERGLE-D02N-WSC	U CCB-I
Antimony	1.5	1.3	1.3	1.4	1.4	0.488		RR-11B2-D02N-PS RR-11B2-D02N-WSC RR-11B3-D02N-PS RR-11B3-D02N-WSC RR-13A-D02N-PS RR-13A-D02N-WSC RR-13B-D02N-PS RR-13B-D02N-WSC RR-5BB-D02N-PS RR-5BB-D02N-WSC ZWERGLE-D02N-PS ZWERGLE-D02N-WSC	U CCB, MB-I
Beryllium	---	---	0.5	---	---	---		RR-11B2-D02N-PS	U CCB-I
Copper	-1.5	-1.5	-1.4	-1.5	-1.4	-0.915		RR-11B2-D02N-PS RR-11B2-D02N-WSC RR-11B3-D02N-PS RR-11B3-D02N-WSC RR-13A-D02N-WSC ZWERGLE-D02N-PS ZWERGLE-D02N-WSC	J/UJ CCB, MB-L
								RR-13B-D02N-WSC	J CCB-L
Iron	36.3	40.9	54.0	---	---	---		RR-11B2-D02N-PS RR-11B2-D02N-WSC RR-11B3-D02N-PS RR-11B3-D02N-WSC RR-13A-D02N-WSC RR-5BB-D02N-PS RR-5BB-D02N-WSC ZWERGLE-D02N-PS ZWERGLE-D02N-WSC	U CCB-I

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Molybdenum	0.8	---	---	---	---	---		RR-11B2-D02N-WSC RR-11B3-D02N-PS RR-11B3-D02N-WSC ZWERGLE-D02N-PS ZWERGLE-D02N-WSC	U CCB-I
Nickel	-1.4	-1.4	-1.4	-1.4	-1.4	-1.333		ZWERGLE-D02N-PS ZWERGLE-D02N-WSC	UJ CCB, MB-L
Silver	-0.1	-0.1	-0.1	-0.1	-0.1	-0.129		RR-11B2-D02N-PS RR-11B2-D02N-WSC RR-11B3-D02N-PS RR-11B3-D02N-WSC RR-13A-D02N-PS RR-13A-D02N-WSC RR-13B-D02N-PS RR-13B-D02N-WSC RR-5BB-D02N-PS RR-5BB-D02N-WSC ZWERGLE-D02N-PS ZWERGLE-D02N-WSC	UJ CCB, MB-I

CCBx = Continuing Calibration Blank RL=Reporting Limit IDL= Instrument Detection Limit

Note: The IDL was used as the RL.

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT316

Sampling Events: GSI Groundwater/Surface Water Interaction Study

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **Yes**

Data Reviewer: Jennifer Winnike

Date Completed: 12/01/04

Peer Reviewer: Stacey Coker

Date Completed: 12/01/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics
RR-13A-T04N-SFW	SA	589520		W	X[2]	X
RR-13A-D04N-SFW	SA	589521		W	X	X[3]
RR-13B-T04N-SFW	SA	589522		W	X[2]	X
RR-13B-D04N-SFW	SA	589523		W	X	X[3]
RR-13A-T04N-PS	SA	589524		W		X[4]
RR-13A-D04N-PS	SA	589525		W	X	X[3]
RR-13B-T04N-PS	SA	589526		W		X[4]
RR-13B-D04N-PS	SA	589527		W	X	X[3]
RR-13A-T04N-WSC	SA	589528		W		X[4]
RR-13A-D04N-WSC	SA	589529		W	X	X[3]
RR-13B-T04N-WSC	SA	589530		W		X[4]
RR-13B-D04N-WSC	SA	589531		W	X	X[3]

Matrix: W = Water FD = Field Duplicate

QC Type: SA = Sample RB = Rinsate Blank

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Total metals includes Aluminum and Iron only.

[3]For "D00N" samples only dissolved organic carbon (DOC) was analyzed.

[4]Reduced inorganic suite due to limited sample volume.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • LD	N/A	Matrix QC samples were not analyzed with this SDG. The matrix quality control results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-13A-D04N-SFW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analyses run on sample RR-13A-D04N-SFW. The results were only applicable for 2 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. Both %Ds were <10%, therefore, no qualifications of data were necessary. The serial dilution results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. With the exception of the samples collected from the chambers within the sediments (WSCs), all reported cation/anion balances met this criterion. Please note that the percent difference values for the WSC samples are not considered fully representative of the charge balance because all of the components of the calculation were not measured for these samples due to the limited sample volume available. As such data qualification for WSC samples based on charge balance differences >13% was not considered necessary. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances. One result was outside criteria for the total vs. partial analysis of total organic carbon and dissolved organic carbon. Table 2 summarizes the outlying results and the resultant data qualifications.
Field QC • Field Duplicate • Rinsate Blank	N/A	Field QC samples were not analyzed with this SDG. The field QC results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the GSI Groundwater Surface Water Interaction Study.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	The chloride analysis of the calibration check designated CCV#1 from the 10/07/04 analytical sequence yielded a percent recovery of 111% that slightly exceeded the upper control limit of the 90-110% acceptance range. The chloride results for associated samples RR-13A-T04N-SFW and RR-13B-T04N-SFW were qualified as estimated (J CCV-H). The nitrate/nitrite analysis of the calibration check standard designated CCV#2 from the 10/06/04 analytical sequence yielded a percent recovery of 111% that slightly exceeded the upper control limit of the 90-110% acceptance range. The nitrate/ nitrite result for sample RR-13B-T04N-SFW was qualified as estimated (J CCV-H).
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	N/A	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC • Thermal stability • Tuning/Mass Calibration • Resolution • ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu was not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. Acceptable performance is inferred from ongoing acceptable QC sample results.

Table 1
Blank Detections Resulting in Qualification

Analyte	CCB5 (µg/l)	CCB6 (µg/l)	CCB8 (µg/l)	CCB9 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	1.4	1.3	-0.4	-0.4	0.488		RR-13A-D04N-PS RR-13A-D04N-WSC RR-13B-D04N-PS RR-13B-D04N-SFW RR-13B-D04N-WSC	U CCB, MB-I
							RR-13A-D04N-SFW	UJ CCB-L
Arsenic	---	-0.1	---	-0.1	---		RR-13A-D04N-PS RR-13A-D04N-WSC RR-13B-D04N-PS RR-13B-D04N-SFW RR-13B-D04N-WSC RR-13A-D04N-SFW	UJ CCB-L
Beryllium	0.4 CCB 2	---	---	---	---		RR-13A-D04N-WSC RR-13B-D04N-WSC	U CCB-I
Cadmium	---	-0.1	-0.2	-0.2	---		RR-13A-D04N-SFW RR-13A-D04N-WSC RR-13B-D04N-SFW RR-13B-D04N-WSC	J/UJ CCB-L
Chromium	-1.4 CCB 1	-1.2 CCB 2	---	---	---		RR-13A-D04N-PS RR-13A-D04N-WSC RR-13B-D04N-PS RR-13B-D04N-SFW RR-13B-D04N-WSC	J/UJ CCB-L
Copper	-1.5	-1.4	-1.0	-1.0	-0.915		RR-13A-D04N-SFW RR-13B-D04N-SFW	J CCB, MB-L
							RR-13A-D04N-WSC RR-13B-D04N-WSC	J CCB-L
Iron	---	---	47.8 CCB 3	---	---		RR-13A-D04N-WSC RR-13B-D04N-SFW	U CCB-I
Selenium	---	-0.3	0.3	---	---		RR-13A-D04N-PS RR-13A-D04N-WSC RR-13B-D04N-PS RR-13B-D04N-SFW RR-13B-D04N-WSC RR-13A-D04N-SFW	J/UJ CCB-L
Silver	-0.1	-0.1	-0.1	-0.1	-0.129		RR-13A-D04N-PS RR-13A-D04N-WSC RR-13B-D04N-PS RR-13B-D04N-SFW RR-13B-D04N-WSC RR-13A-D04N-SFW	UJ CCB, MB-L
Vanadium	---	---	-0.1	---	---		RR-13A-D04N-SFW	UJ CCB-L

CCBx = Continuing Calibration Blank RL= Reporting Limit IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 2
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	Results[1] mg/L	%RPD or Absolute Difference	RL mg/L	Evaluation Criteria	Action
Total Organic Carbon vs Dissolved Organic Carbon					
RR-13B-T04N-SFW/ RR-13B-D04N-SFW	1.4	AD= 4.3 X RL	1.0	AD= <2 X RL	J TVP-I for parent samples
	5.7				

[1]It is the opinion of the data reviewer that it is highly likely that the labels for the TOC and DOC samples were inadvertently reversed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT317

Sampling Events: GSI Groundwater/Surface Water Interaction Study

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike

Date Completed: 11/08/04

Peer Reviewer: Stacey Coker

Date Completed: 12/11/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals[2]	Inorganics[3]
RR-13A-T03N-SFW	SA	589833		W	X	X
RR-13A-D03N-SFW	SA	589834		W	X	X
RR-13B-T03N-SFW	SA	589835		W	X	X
RR-13B-D03N-SFW	SA	589836		W	X	X
RR-11B2-T03N-SFW	SA	589837		W	X	X
RR-11B2-D03N-SFW	SA	589838		W	X	X
RR-11B3-T03N-SFW	SA	589839		W	X	X
RR-11B3-D03N-SFW	SA	589840		W	X	X
ZWERGLE-T03N-SFW	SA	589841		W	X	X
ZWERGLE-D03N-SFW	SA	589842		W	X	X
RR-5BB-T03N-SFW	SA	589843		W	X	X
RR-5BB-D03N-SFW	SA	589844		W	X	X
ZWERGLE-T04N-SFW	SA	589845		W	X	X
ZWERGLE-D04N-SFW	SA	589846		W	X	X
RR-5BB-T04N-SFW	SA	589847		W	X	X
RR-5BB-D04N-SFW	SA	589848		W	X	X
RR-11B2-T04N-SFW	SA	589849		W	X	X
RR-11B2-D04N-SFW	SA	589850		W	X	X
RR-11B3-T04N-SFW	SA	589851		W	X	X
RR-11B3-D04N-SFW	SA	589852		W	X	X

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Total metals includes Aluminum and Iron only

[3]For "D03N" samples only dissolved organic carbon (DOC) was requested and analyzed.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The nitrite and orthophosphate samples were analyzed 2-3 days beyond the prescribed holding time. Table 1 lists the samples that were analyzed outside holding time and the resultant data qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 2 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • LD	N/A	Matrix QC samples were not analyzed with this SDG. The matrix quality control results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-13A-D03N-SFW • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	Yes	The serial dilution analysis was run on sample RR-13A-D03N-SFW. The serial dilution results were only applicable for 1 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. No qualifications of data were necessary. The serial dilution results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances Several sample results were outside criteria for the total vs. partial analysis of total organic carbon and dissolved organic carbon. Table 3 summarizes the outlying results and the resultant data qualifications.
Field QC • Field Duplicate • Rinsate Blank	N/A	Field QC samples were not analyzed with this SDG. The field QC results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the GSI Groundwater/ Surface Water Interaction Study.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Holding Time Qualifications for Inorganics

Sample	Nitrite (mg/L)	Orthophosphate (mg/L)
RR-13A-T03N-SFW	0.0050 UJ	0.010 UJ
RR-13B-T03N-SFW	0.0050 UJ	0.010 UJ
RR-11B2-T03N-SFW	0.0050 UJ	0.010 UJ
RR-11B3-T03N-SFW	0.0050 UJ	0.010 UJ
ZWERGLE-T03N-SFW	0.0050 UJ	0.010 UJ
RR-5BB-T03N-SFW	0.0050 UJ	0.010 UJ
ZWERGLE-T04N-SFW	0.0050 UJ	0.010 UJ
RR-5BB-T04N-SFW	0.0050 UJ	0.010 UJ
RR-11B2-T04N-SFW	0.0050 UJ	0.010 UJ
RR-11B3-T04N-SFW	0.0050 UJ	0.010 UJ

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	1.7	1.5	1.6	---	1.106		RR-11B2-D03N-SFW RR-11B2-D04N-SFW RR-11B3-D03N-SFW RR-11B3-D04N-SFW RR-13A-D03N-SFW RR-13B-D03N-SFW RR-5BB-D03N-SFW RR-5BB-D04N-SFW ZWERGLE-D03N-SFW ZWERGLE-D04N-SFW	U CCB, MB-I
Boron	---	---	---	---	7.614		RR-13A-D03N-SFW	U CCB-I

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Cadmium	-0.2	-0.2	-0.2	---	-0.193		RR-11B2-D03N-SFW RR-11B2-D04N-SFW RR-11B3-D03N-SFW RR-11B3-D04N-SFW RR-13A-D03N-SFW RR-13B-D03N-SFW RR-5BB-D03N-SFW RR-5BB-D04N-SFW ZWERGLE-D03N-SFW ZWERGLE-D04N-SFW	J/UJ CCB, MB-L
Chromium	---	-1.3	-1.8	---	---		RR-11B2-D03N-SFW RR-11B2-D04N-SFW RR-11B3-D03N-SFW RR-11B3-D04N-SFW RR-13A-D03N-SFW RR-13B-D03N-SFW RR-5BB-D03N-SFW RR-5BB-D04N-SFW ZWERGLE-D03N-SFW ZWERGLE-D04N-SFW	UJ CCB-L
Copper	-1.1	-1.1	-1.1	---	-0.659		RR-11B2-D03N-SFW RR-11B2-D04N-SFW RR-11B3-D03N-SFW RR-11B3-D04N-SFW ZWERGLE-D03N-SFW ZWERGLE-D04N-SFW	J/UJ CCB, MB-L
							RR-13A-D03N-SFW RR-13B-D03N-SFW RR-5BB-D03N-SFW RR-5BB-D04N-SFW	J CCB-L
Iron	-40.8	-73.4	-70.6	-39.0	-57.21		RR-11B2-D03N-SFW RR-11B2-D04N-SFW RR-11B3-D03N-SFW RR-11B3-D04N-SFW RR-13A-D03N-SFW RR-13B-D03N-SFW RR-5BB-D03N-SFW RR-5BB-D04N-SFW ZWERGLE-D03N-SFW ZWERGLE-D04N-SFW	UJ CCB, MB-L
Nickel	-1.2	-1.2	-1.3	---	-1.178		RR-5BB-D03N-SFW RR-5BB-D04N-SFW ZWERGLE-D03N-SFW ZWERGLE-D04N-SFW	J/UJ CCB, MB-L

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Silver	-0.2	-0.2	-0.2	---	-0.161		RR-11B2-D03N-SFW RR-11B2-D04N-SFW RR-11B3-D03N-SFW RR-11B3-D04N-SFW RR-13A-D03N-SFW RR-13B-D03N-SFW RR-5BB-D03N-SFW RR-5BB-D04N-SFW ZWERGLE-D03N-SFW ZWERGLE-D04N-SFW	UJ CCB, MB-L
Mercury	-0.1	-0.2	-0.1	---	---		RR-11B2-D03N-SFW RR-11B2-D04N-SFW RR-11B3-D03N-SFW RR-11B3-D04N-SFW RR-13A-D03N-SFW RR-13B-D03N-SFW RR-5BB-D03N-SFW RR-5BB-D04N-SFW ZWERGLE-D03N-SFW ZWERGLE-D04N-SFW	UJ CCB-L

CCBx = Continuing Calibration Blank RL=Reporting Limit IDL= Instrument Detection Limit

Note: The IDL was used as the RL.

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 3
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	%RPD or Absolute Difference	RL	Applicable Evaluation Criteria	Action
Total Organic Carbon vs Dissolved Organic Carbon				
RR-13B-T03N-SFW/ RR-13B-D03N-SFW	AD= 8.7 x RL	1.0	AD= <2 x RL	J TvP-I
RR-11B3-T04N-SFW/ RR-11B3-D04N-SFW	AD= 8.0 x RL	1.0	AD= <2 x RL	

AD= Absolute Difference

RL= Reporting Limit

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT318

Sampling Events: GSI Groundwater/Surface Water Interaction Study

Matrix: Solid ___ Water _X_ Biota ___

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **No**

Data Reviewer: Jennifer Winnike

Date Completed: 11/17/04

Peer Reviewer: Stacey Coker

Date Completed: 12/11/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics[2]
RR-13A-T03N-PS	SA	589866		W		X
RR-13A-D03N-PS	SA	589867		W	X	X
RR-13B-T03N-PS	SA	589868		W		X
RR-13B-D03N-PS	SA	589869		W	X	X
RR-13A-T03N-WSC	SA	589870		W		X[3]
RR-13A-D03N-WSC	SA	589871		W	X	X
RR-13B-T03N-WSC	SA	589872		W		X[3]
RR-13B-D03N-WSC	SA	589873		W	X	X
RR-11B2-T03N-PS	SA	589874		W		X
RR-11B2-D03N-PS	SA	589875		W	X	X
RR-11B3-T03N-PS	SA	589876		W		X
RR-11B3-D03N-PS	SA	589877		W	X	X
RR-11B2-T03N-WSC	SA	589878		W		X[3]
RR-11B2-D03N-WSC	SA	589879		W	X	X
RR-11B3-T01N-WSC	SA	589880		W		X[3]
RR-11B3-D01N-WSC	SA	589881		W	X	X
ZWERGLE-T03N-PS	SA	589882		W		X
ZWERGLE-D03N-PS	SA	589883		W	X	X
RR-5BB-T03N-PS	SA	589884		W		X
RR-5BB-D03N-PS	SA	589885		W	X	X
ZWERGLE-T03N-WSC	SA	589886		W		X[3]
ZWERGLE-D03N-WSC	SA	589887		W	X	X
RR-5BB-T03N-WSC	SA	589888		W		X
RR-5BB-D03N-WSC	SA	589889		W	X	X
ZWERGLE-T04N-PS	SA	589890		W		X
ZWERGLE-D04N-PS	SA	589891		W	X	X
RR-5BB-T04N-WSC	SA	589892		W		X
RR-5BB-D04N-WSC	SA	589893		W	X	X
ZWERGLE-T04N-WSC	SA	589894		W		X[3]
ZWERGLE-D04N-WSC	SA	589895		W	X	X

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals	Inorganics[2]
RR-5BB-T04N-WSC	SA	589896		W		X[3]
RR-5BB-D04N-WSC	SA	589897		W	X	X
RR-11B2-T04N-PS	SA	589898		W		X
RR-11B2-D04N-PS	SA	589899		W	X	X
RR-11B3-T04N-PS	SA	589900		W		X
RR-11B3-D04N-PS	SA	589901		W	X	X
RR-11B2-T04N-WSC	SA	589902		W		X[3]
RR-11B2-D04N-WSC	SA	589903		W	X	X
RR-11B3-T04N-WSC	SA	589904		W		X[3]
RR-11B3-D04N-WSC	SA	589905		W	X	X

Matrix: W = Water PS = Piezometer Composite Sample

QC Type: SA = Sample WSC = Within Sediment Camber and Composite Symbol

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Limited inorganics: fluoride, sulfate, TOC and Alkalinity.

[3]Inorganics limited to fluoride, sulfate and TOC.

[4]For "D04N" samples, only dissolved organic carbon (DOC) was requested and analyzed.

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

During the TOC analysis of 10/27/04, the calibration check standards designated as CCV2 and CCV3 yielded percent recoveries that were outside control criteria. The recoveries were 84% and 114%, respectively, outside the acceptance range of 90-110%. The associated samples were qualified as estimated with either a low, indeterminate or high bias (J CCV-L, J CCV-I or J CCV-H). Sample results that were nondetect and associated with a high bias CCV did not require qualification.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	No	The samples in this SDG were received with elevated cooler temperatures (11°C and 12°C) due to a delivery delay caused by FedEx. Permission was given by URS to proceed with the analyses. The QAPP states that only the inorganics need to be kept at 4°C. All inorganic results were qualified as estimated (J/UJ P-I).
Holding Times	Yes	
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1 summarizes the blank detections and the resultant data qualifications.
Matrix QC • MS/MSD • LD	N/A	Matrix QC samples were not analyzed with this SDG. The matrix quality control results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Method QC • Surrogates • Serial Dilution RR-13A-D03N-PA • Total vs. Partial Analyses • Cation/Anion Balance • Internal Standards	No	The serial dilution analyses run on sample RR-13A-D03N-PS. The results were only applicable for 9 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. Table 2 summarizes the outlying results and the resultant data qualifications. The serial dilution results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The data package does not include the ion balance spreadsheet normally provided for the water samples. This is due to the fact that some of the constituents in the calculation were not required analytical parameters.
Field QC • Field Duplicate • Rinsate Blank	N/A	Field QC samples were not analyzed with this SDG. The field QC results for the September 2004 GSI Groundwater/ Surface Water Interaction Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the GSI Groundwater Surface Water Interaction Study.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes," "No," or "Not Applicable (N/A)."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Aluminum	---	---	---	39.5	---		RR-11B2-D04N-WSC RR-11B3-D04N-PS	U CCB-I
Antimony	0.6	0.5	0.5	0.6	0.417		RR-11B2-D03N-PS RR-11B2-D03N-WSC RR-11B2-D04N-PS RR-11B2-D04N-WSC RR-11B3-D03N-PS RR-11B3-D03N-WSC RR-11B3-D04N-PS RR-11B3-D04N-WSC RR-13A-D03N-PS RR-13A-D03N-WSC RR-13B-D03N-PS RR-13B-D03N-WSC RR-5BB-D03N-PS RR-5BB-D03N-WSC RR-5BB-D04N-PS RR-5BB-D04N-WSC ZWERGLE-D03N-PS ZWERGLE-D03N-WSC ZWERGLE-D04N-PS ZWERGLE-D04N-WSC	U CCB, MB-I
Arsenic	---	---	0.1	---	0.103		RR-13A-D03N-WSC	U MB-I
							RR-11B2-D03N-PS RR-11B2-D03N-WSC RR-11B2-D04N-PS RR-11B2-D04N-WSC RR-11B3-D03N-PS RR-11B3-D03N-WSC RR-11B3-D04N-WSC ZWERGLE-D03N-PS ZWERGLE-D04N-PS ZWERGLE-D03N-WSC ZWERGLE-D04N-WSC	U CCB, MB-I

Table 1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Chromium	---	1.3	2.8	2.4	---		RR-13A-D03N-PS RR-5BB-D03N-PS RR-5BB-D04N-PS ZWERGLE-D04N-WSC	U CCB-I
Copper	0.6	0.6	0.6	0.7	1.3		RR-11B2-D03N-WSC RR-11B3-D03N-PS RR-11B3-D03N-WSC RR-11B3-D04N-WSC	U MB-I
							RR-11B2-D03N-PS RR-11B2-D04N-PS RR-11B2-D04N-WSC RR-11B3-D04N-PS ZWERGLE-D03N-WSC ZWERGLE-D04N-PS ZWERGLE-D04N-WSC	U CCB, MB-I
Molybdenum	1.5	1.3	1.3	1.3	1.255		RR-11B2-D03N-PS RR-11B2-D03N-WSC RR-11B2-D04N-PS RR-11B2-D04N-WSC RR-11B3-D03N-PS RR-11B3-D03N-WSC RR-11B3-D04N-PS RR-11B3-D04N-WSC RR-13A-D03N-WSC RR-13B-D03N-WSC ZWERGLE-D03N-PS ZWERGLE-D03N-WSC ZWERGLE-D04N-PS ZWERGLE-D04N-WSC	U CCB, MB-I
Vanadium	02	0.1	0.2	0.2	0.197	0.10	RR-11B2-D03N-PS RR-11B2-D03N-WSC RR-11B2-D04N-PS RR-11B2-D04N-WSC RR-11B3-D03N-PS RR-11B3-D03N-WSC RR-11B3-D04N-PS RR-11B3-D04N-WSC RR-13A-D03N-PS RR-13A-D03N-WSC RR-13B-D03N-PS RR-13B-D03N-WSC RR-5BB-D03N-PS RR-5BB-D03N-WSC RR-5BB-D04N-PS RR-5BB-D04N-WSC ZWERGLE-D03N-PS ZWERGLE-D03N-WSC ZWERGLE-D04N-PS ZWERGLE-D04N-WSC	U CCB, MB-I

CCBx = Continuing Calibration Blank RL = Reporting Limit IDL = Instrument Detection Limit

Note: The IDL was used as the RL.

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

Table 2
Serial Dilutions Resulting in
Parent Sample Qualifications

Analyte	Sample Result (ug/L)	Serial Dilution Result (ug/L)	%D	Qualification
RR-13A-D03N-PS				
Manganese	7587	8353	10.1	None, sample result rounds to 10%
Zinc	1954	2177	11.4	J DL-L for parent sample

Table 3
Total vs. Partial Qualifications for Inorganics

Sample/Analytes	%RPD or Absolute Difference	RL	Evaluation Criteria	Action
Total Organic Carbon vs Dissolved Organic Carbon				
RR-11B2-T04N-PS/ RR-11B2-D04N-PS	AD=2.6X RL	1.0	AD= <2 X RL	J TVP-I for parent samples

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: SOL114

Sampling Events: September 2004/GSI Study Round 3

Matrix: Solid _X_ Water ___ Biota ___

Sample-specific Parameter Review? **Yes**

Laboratory Performance Parameters? **Yes**

Data Reviewer: Karen Kronoveter

Date Completed: 12/07/04

Peer Reviewer: Stacey Coker

Date Completed: 12/11/04

The table below summarizes the results presented in this data package.

Field ID(1)	QC Type	Lab ID	Matrix	Analyses	
				Metals	Inorganics
ZWERGLE-T04N-SED	SA	590167	S	X	X
RR-5BB-T04N-SED	SA	590168	S	X	X
RR-11B2-T04N-SED	SA	590169	S	X	X
RR-11B2-T04D-SED	FD	590170	S	X	X
RR-11B3-T04N-SED	SA	590171	S	X	X
RR-13A-T04N-SED	SA	590172	S	X	X
RR-13B-T04N-SED	SA	590173	S	X	X

Matrix: S = Solid (sediment)
QC Type: SA = Sample FD = Field Duplicate

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comments section if they fell outside review criteria.

Case Narrative Summary: Issues noted in the case narrative, potentially affecting data quality, are addressed in the following discussion or covered in the data review summary table below.

The laboratory case narrative noted that in order to more accurately report TOC concentrations from peaks with areas lower than that of the lowest curve point (5000 mg/kg), the laboratory has implemented the use of an additional low-level calibration curve for processing the results for samples with small peak areas. All samples with peak areas from at least one replicate that are lower than the lowest calibration point are processed using this curve, as well as the associated blank analyses. In this delivery group, all samples were processed using this low-level curve. This did not affect the quality or usability of the TOC data results. It is noted that the preparatory blank associated with the samples in this delivery group exceeded the reporting limit (RL) referenced in the QAPP for TOC (100 mg/kg). The potential effect this had on the qualification of data results is addressed in the table under the section of method blanks.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	The QAPP holding time specifications for the measurements of specific conductance and pH requires immediate analysis of the samples upon arrival at the laboratory. Conductivity measurements for all samples were taken 11 days after sampling and 9 days beyond log-in. The pH for all samples was measured 5 days beyond log-in. Therefore, all conductivity and pH results were qualified as estimated (J). Table 1.1 summarizes these samples along with the qualifications. All samples qualified on the basis of holding time were assigned indeterminate direction of bias.
Method Blanks	No	TOC was detected in the method blank associated with analysis run of 10/07/04 at a concentration of 362 mg/Kg. All TOC sample results, with the exception of sample ZWERGLE-T04N-SED, were less than 5x the blank detection, resulting in the qualification of TOC results as nondetect at the respective reported concentrations, with indeterminate bias directions assigned. Several analytes were detected in the metals method and continuing calibration blanks. The majority of the detected analytes were reported in the samples at concentrations sufficiently (5x) larger than the blank detections or not detected. However, several results were qualified on the basis of blank detections, as summarized in Table 1.2.
Matrix QC MS/D RR-5BB-T04N-SED LD RR-5BB-T04N-SED PDS RR-5BB-T04N-SED	No	Antimony was recovered outside the acceptance range of 75-125% for the matrix spike analysis of sample RR-5BB-T04N-SED. The antimony percent recovery of 52.5% resulted in the qualification of the antimony result in this parent sample as estimated (J) with a low bias direction assigned. Post digestion spikes were performed on all metal analytes. The post digestion spike recoveries for those analytes that did not meet the specified criterion for the initial matrix spike recoveries were reviewed. As the reviewed post matrix spike recoveries were within 75-125%, no qualification on the basis of post digestion spike recoveries were necessary. Laboratory duplicate analysis results were reviewed to evaluate the precision of the laboratory analyses. The TOC result for sample RR-5BB-T04N-SED was qualified as estimated (UJ) with an indeterminate bias direction assigned. Both original and duplicate sample results for TOC were in excess of 5x the RL, with a relative percent difference (RPD) of 41%. Despite the fact that the laboratory duplicate summary forms reported RPDs in excess of the evaluation criterion for several metal analytes, no qualification of data was necessary when the CRDL was used in place of the IDL, adjusted for dilution, for the concentration-dependent comparison calculations. As such, no metal results were qualified based on laboratory duplicate results. The matrix quality control results for the 2004 GIS Round 3 sampling event will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Method QC Serial Dilution RR-5BB-T04N-SED Internal Standards	Yes	The serial dilution analysis conducted on matrix spike sample RR-5BB-T04N-SED was not applicable for 15 of the 24 metal analytes, respectively, as the remaining analytes exhibited initial concentrations in excess of 50 times the IDL. The percent deviations between the original results and its 5-fold dilutions were compared to an evaluation criterion of ±10%. No qualification of data resulted on the basis of the serial dilution evaluation. The serial dilution results for the 2004 GIS Round 3 sampling event will be evaluated collectively and any additional data qualifications will be summarized in the overall assessment.
Field QC Field Duplicate RR-11B2-T04N/D-SED Rinsate Blank Field Blank	Yes	One field duplicate pair was assessed for field duplicate agreement. All sample results met the criteria as set forth in SOP 12.1 for field duplicates. The field duplicate results for the 2004 GSI Round 3 sampling event will be evaluated collectively and any resultant data qualifications will be summarized in the overall assessment.
Nondetect Results w/ Elevated RLs?	Yes	
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	
Laboratory Performance Parameters	Complete with "Yes", "No", or "N/A".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Initial/Continuing Calibration Verification	Yes	
Laboratory Control Sample Results	Yes	
Compound Identification	Yes	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e. generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS CRDL	Yes	Information regarding the mass calibration and resolution are not available due to the software limitations. However, acceptable performance can be inferred from the other QC sample results, which satisfied evaluation criteria. **ICS –** Results for a few analytes not present ion the ICS standard solution were reported with absolute values greater than the MDL. However, due to the fact that the interferent elements in the samples were not present in concentrations exceeding those of the interference check standard (ICS), the samples were not evaluated for any positive or negative biases suggested by the ICS A analyses.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable."	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
		CRDL - The CRDL standard data was included in the analytical data packages, although not required. These data were reviewed as part of the data validation process. All recoveries were within the 50-150% criteria.

Table 1.1
Holding Time Qualifications for Inorganics

Sample	Cond. (µmhos/cm)	PH (std units)
ZWERGLE-T04N-SED	99.5 J	7.4 J
RR-5BB-T04N-SED	128 J	6.0 J
RR-11B2-T04N-SED	82.1 J	6.5 J
RR-11B2-T04D-SED	86.3 J	6.8 J
RR-11B3-T04N-SED	80.1 J	6.6 J
RR-13A-T04N-SED	62.8 J	6.8 J
RR-13B-T04N-SED	43.6 J	6.0 J

Table 1.2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	MB (mg/kg)	IDL (µg/L)	Samples Qualified	Qualification Codes
Antimony (MS)	1.2	1.2	1.3	0.904	0.30	All sample results were qualified	U MB,CCB-I
Boron (P)	---	---	---	1.503	6.9		U MB-I
Cadmium (P)	---	---	---	0.172	0.5		
TOC	---	---	---	362	135	All sample results were qualified with the **exception of**: ZWERGLE-T04N-SED	U MB-I

MS=ICP-MS P=ICP CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA VALIDATION REPORT
FOR THE
SURFACE WATER SAMPLES
ASSOCIATED WITH THE
SEPTEMBER 2004 RADON STUDY

A COMPONENT OF THE
SUPPLEMENTAL SPRING 13 AND
SPRING 39 SAMPLING EVENT

Prepared for
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TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Dilution Schemes/Non-Detects With Elevated Rls 3-1
3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses: 3-1
3.2.3 Non-Valid Matrix Spikes 3-1
3.2.4 Laboratory Performance Review (LPR) Findings 3-2

Section 4 Collective Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-1
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-2
4.3 ICP Serial Dilution Results 4-2
4.3.1 Surface Water 4-4

Section 5 Collective Assessment of Field QC Results 5-1

5.1 Field Duplicate Agreement 5-1
5.2 Rinsate Blank Results 5-1

Section 6 Overall Data Quality Indicator Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-2
6.4 Representativeness 6-2
6.5 Comparability 6-2
6.6 Sensitivity 6-3

List of Tables

Table 1-1 Summary of Surface Water Samples Collected February 2004
Table 4-1 Matrix Spike Results
Table 4-2 ICP Serial Dilution Results
Table 4-3 ICP Serial Dilution Overall Assessment
Table 5-1 Summary of Rinsate Blank Results and Additional Qualifications
Table 6-1 Summary of Precision Assessment
Table 6-2 Summary of Accuracy Assessment

TABLE OF CONTENTS

List of Attachments

Attachment 1.1 Data Review Summary for Data Package WAT319S

Attachment 1.2 Data Review Summary for Data Package WAT320S

This Data Validation Report (DVR) provides a general overview of the usability of chemical data obtained for surface water samples collected during the September 2004 Tracer Radon Study at Molycorp Questa Mine in Questa, New Mexico. The Radon Tracer Study was one component of the Supplemental Spring 13 and Spring 39 Sampling Event conducted as part of the Molycorp RI/FS. This report contains the results and process of the sample specific data reviews and collective evaluations for the surface water samples analyzed in association with the Radon Study.

The surface water samples were submitted to Severn Trent Laboratories (STL) Burlington in Colchester, Vermont for chemical analysis. The analytical methods utilized were according to the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). Results for field and quality control (QC) samples were reported in two original packages. All surface water samples were analyzed for total metals (aluminum and iron only), dissolved metals, and inorganic parameters (aqueous media).

Table 1-1 summarizes the surface water samples collected during this sampling event, along with the analyses performed on each sample and the accompanying QC samples.

Table 1-1
Summary of Surface Water Samples Collected February 2004

Sample Identification[1]	Total Metals	Dissolved Metals	Inorganics
RB01T-SFW (WAT320S)*	X	X	X
SFM13-1-T01N-SFW (WAT319S)	X	X	X
SFM13-2-T01N-SFW (WAT319S)	X	X	X
SFM13-3-T01N-SFW (WAT319S)	X, FD	X, FD	X, FD
SFM13-4-T01N-SFW (WAT319S)	X	X	X
SFM13-5-T01N-SFW (WAT319S)	X	X	X
SFM13-6-T01N-SFW (WAT319S)	X, MS/LD	X, MS/LD	X, MS/LD
SFM39-1-T01N-SFW (WAT319S)	X	X	X
SFM39-2-T01N-SFW (WAT319S)	X	X	X
SFM39-3-T01N-SFW (WAT319S)	X	X	X
SFM39-4-T01N-SFW (WAT320S)	X	X	X
SFM39-5-T01N-SFW (WAT320S)	X	X	X
SFM39-6-T01N-SFW (WAT320S)	X	X	X
SFM39-7-T01N-SFW (WAT320S)	X	X	X
SFM39-8-T01N-SFW (WAT320S)	X	X	X
Number SFW samples	14	14	14
Number MS/LD	1	1	1
Number Field Duplicates	1	1	1
Number Rinsate Blanks	1	1	1

FD = Field Duplicate MS/LD = Matrix Spike/Laboratory Duplicate RB = Rinsate Blank

[1]The "T01N" portion of the field ID was replaced with "D01N" for the dissolved analysis.

Rinsate Blank sample associated with sample RR-DS-Spring 39 (collected during the same sampling round, but only assessed field parameters)

The data review process evaluated sample-specific and laboratory performance criteria in accordance with the standard operating procedure (SOP) 12.1. As mentioned in the SOP, all RI/FS data generated for the Questa Mine received an evaluation of sample-specific parameters. In addition, 10% of the data packages (per analysis type per event/episode) were reviewed for laboratory performance parameters. The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1 was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria, and lastly (if prior references did not specify the criteria in question), the laboratory historical ranges determined acceptance ranges.

Sample-specific reviews evaluated the following sample related parameters:

- Case narrative comments
- Chain-of-Custody/Sample Receipt
- Holding Times
- Method Blank (Preparation Blank)
- Matrix-Dependent Quality Control
  - Matrix Spike Analysis
  - Laboratory duplicate Analysis
- Method-Specific Quality Control Measures
  - Inorganic Method Specific QC Measures
    - Post Digestion Spike Analysis
    - ICP Serial Dilution Tests
    - Internal Standard Performance
    - Cation/Anion Balance Evaluation
  - Organic Method Specific QC Measures
    - Surrogate Spike Compound Recovery
    - Internal Standards
- Total vs Partial Balance
- Field quality control samples
  - Field Duplicate Agreement
  - Rinsate Blank Results
  - Field Blank Results
  - Trip Blank Results

Evaluation of laboratory performance parameters provided an overall representation of the analytical system at the time the samples were analyzed. The laboratory performance review evaluated parameters in control of the laboratory, but independent of the field samples analyzed, as follows:

- Initial Calibration
- Continuing Calibration Verification
- Laboratory Control Sample Analysis
- Compound Identification
- Target Analyte Quantification
- Verification
- Method Specific Quality Control Checks

If any potential systematic problems were determined upon review of the laboratory performance parameters in the selected package evaluated (meeting the 10% criteria), the review parameter was evaluated in the other data package associated with this sampling event and media type to determine the need for data qualification. Instances, in which professional judgment was exercised in evaluating the need for data qualification, the basis for this rationale was provided in the data validation review summary reports.

Upon completion of the sample-specific reviews and laboratory performance reviews, a collective assessment for the event was performed. Site-specific matrix spike, laboratory duplicate, serial dilution, blank (field and rinsate), and field duplicate results were assessed collectively by matrix per event to determine the need for qualification of sample results of similar matrix. The Environmental Protection Agency's (EPA) SW-846 methods specify that QC samples such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered more representative of the site sample matrix and a good indication of whether there is a matrix effect present with a similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Owing to logistical considerations, it was not possible to assure that each data package contained one set of site-specific QC samples. Therefore, a collective evaluation of all of the site-specific QC samples of a similar matrix was performed to determine whether or not problems identified in a given QC sample are generally true for the site-specific matrix or are likely limited to the specific sample being used for the QC measure. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 3.0 describes data quality issues affecting all of the water packages. Section 4.0 presents the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Section 5.0 summarizes the collective assessment of the field QC results (field and rinsate blanks, when applicable, and field duplicate results) and the resultant sample qualification. Lastly, an overall assessment of data, with respect to the precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters and sensitivity, is presented in Section 6.0.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes the individual data validation review summaries for data packages WAT319S and WAT320S. In order to attain the frequency requirements for laboratory performance reviews, one data package (WAT319S) was evaluated for laboratory performance parameters. Results of the laboratory performance parameter review is summarized in the individual data validation review summary report for the associated data package. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, no issues were identified which globally affected all relevant water samples analyzed for the September 2004 Radon Study. Several data quality issues have been addressed in the individual summary reports.

3.2.1 Dilution Schemes/Non-Detects with Elevated RLs

Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally, greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value.

3.2.2 Bicarbonate Alkalinity/Total Alkalinity Matrix Spike Analyses:

Initially, bicarbonate and total alkalinity results were qualified on the basis of matrix spike recoveries outside the acceptance range of 75-125% in the sample specific reviews. However, employing professional judgment, it has been determined that the matrix spike recoveries for the bicarbonate and total alkalinity analyses were not a pertinent measure of accuracy. The highly variable pH range of the water samples and the associated carbonate species equilbria were found to affect the matrix spike recoveries more than the expected accuracy of the analyses. The matrix-spiked samples were found to have significantly different pHs than the parent samples due to the presence of carbonate, confounded by a dilution effect. Therefore, the matrix spike recovery data for bicarbonate and total alkalinity were not used to assess the accuracy of the analysis.

3.2.3 Non-Valid Matrix Spikes

There were a total of three scenarios in which matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. First, when native sample concentrations were greater than or equal to four times the spiking concentration, the ability to determine accuracy in the analysis was not accurate as the difference in the spike level with the

original analyte concentration was not so discernable due to high concentration levels. In addition, there were several instances in which the reporting limits for various metal analytes were increased due to dilution factors, which affected the reliable quantitation of several spiked metals. In these situations, the reporting limit was greater than the spike concentration added. Related to this scenario, is the last instance in which the difference between the RL concentration and the spike concentration was less than the RL value. Non-valid matrix spike results were excluded from the collective assessment of matrix QC results.

3.2.4 Laboratory Performance Review (LPR) Findings

As mentioned previously, one data package was given a full validation to assess the performance of the laboratory for all analyses. There was no need to examine any other parameters not defined within the scope of the sample-specific data review.

Inorganic parameter matrix QC consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. The site-specific matrix QC results were assessed collectively for the surface water samples associated with the September 2004 Radon Study (surface water, for both total and dissolved fractions) to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.3 present the collective matrix QC results associated with the samples in this event and the resultant data qualifiers.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy and precision of the analytical results. One surface water field sample (SFM13-6-T/D01N-SFW) was designated for total and dissolved metals matrix spike analyses, in addition to inorganics matrix spike analyses. The QAPP required frequency of 5% (1 per 20) for matrix QC samples was satisfied for all analyses, as a frequency of 7.1% (1 per 14) was attained.

All matrix spike recoveries for total metals, dissolved metals, and inorganics were recovered with the prescribed acceptance range of 75-125%, as summarized in Table 4-1. It was therefore unnecessary to qualify any sample results on the basis of matrix spike recoveries. The accuracy of the analyses relative to the site-specific matrix was acceptable.

Table 4-1
Matrix Spike Results

Analyte	Number of Valid Spikes/ Total Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
INORGANICS SURFACE WATER					
Chloride	1/1	0	0	101	NQ
Fluoride	1/1	0	0	105	
Nitrate/Nitrite	1/1	0	0	98	
Nitrite	1/1	0	0	100	
Orthophosphate	1/1	0	0	88	
Phosphorus	1/1	0	0	99	
Sulfate	1/1	0	0	89	
Total Organic Carbon	1/1	0	0	84	
TOTAL METALS SURFACE WATER					
Aluminum	1/1	0	0	101.1	NQ
Iron	1/1	0	0	103.3	
Cyanide	1/1	0	0	108.5	
DISSOLVED METALS SURFACE WATER					
Aluminum	1/1	0	0	96.0	NQ
Antimony	1/1	0	0	102.3	
Arsenic	1/1	0	0	105.8	
Barium	1/1	0	0	87.9	
Beryllium	1/1	0	0	94.2	
Boron	1/1	0	0	90.6	
Cadmium	1/1	0	0	103.0	
Chromium	1/1	0	0	92.5	
Cobalt	1/1	0	0	102.0	
Copper	1/1	0	0	111.8	
Iron	1/1	0	0	100.0	

Table 4-1
Matrix Spike Results

Analyte	Number of Valid Spikes/ Total Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
Lead	1/1	0	0	110.4	
Manganese	1/1	0	0	103.6	
Mercury	1/1	0	0	103.0	
Molybdenum	1/1	0	0	106.4	
Nickel	1/1	0	0	111.8	
Selenium	1/1	0	0	92.5	
Silver	1/1	0	0	123.9	
Thallium	1/1	0	0	109.6	
Vanadium	1/1	0	0	105.5	
Zinc	1/1	0	0	90.8	

NQ = No qualification

4.1.1 Post-Digestion Spikes

Post-digestion spikes were conducted on all ICP and ICP/MS analytes to determine whether matrix recoveries outside of the acceptance range were the result of sample matrix, or due to a bias in the analytical system. As none of the metals matrix spike recoveries were outside of the acceptance range, sample results were not assessed for qualification on the basis of post-digestion recoveries.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Laboratory duplicate sample results were evaluated to assess the precision of the laboratory analyses. The same surface water sample (SFM13-6-T/D01N-SFW) utilized for the matrix spike evaluations was also designated for metals (total and dissolved) and inorganic parameters laboratory duplicate analyses. The evaluation criteria used are summarized in SOP 12.1. For metals, the Contract Laboratory (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

The Relative Percent Differences (RPDs) or absolute differences (as appropriate, based on the sample concentrations) between the parent and duplicate results for target analytes were within the QAPP acceptance limits for all laboratory duplicate analyses. The sample frequency of 7.1% (1 per 14) was attained for the analysis of laboratory duplicate, thereby meeting the QAPP required frequency of 5%. Based on the LD results, the overall level of precision demonstrated is considered to be acceptable.

4.3 ICP SERIAL DILUTION RESULTS

ICP serial dilutions were performed on metal samples in each of the two data packages. These analyses were run on the same samples as were designated for matrix QC analyses, or otherwise selected in data packages in which there were no matrix QC samples. These analyses were used to evaluate whether or not significant physical or chemical interferences existed due to sample

matrix. This was accomplished by analyzing the sample and a five-fold dilution of the sample. The percent difference (%D) between these two concentrations was compared to an acceptance criterion of ≤10%, only for those analytes for which the serial dilution analysis was applicable. Serial dilution results were applicable if the initial analyte concentrations were sufficiently higher (50x) than the IDL, accounting for dilution. Generally, the diluted result is considered more accurate as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result.

Table 4-2 summarizes each sample utilized for a serial dilution analysis, along with the associated applicable analytes, and the analytes for which qualification in the parent sample was necessary (designated by bold text). Qualifications were generally limited to the parent samples if less than a quarter of the valid serial dilution results were outside of the acceptance range. However, additional factors such as the number of valid measurements relative to the size of the sample set and the magnitude of outages were also taken into consideration.

Table 4-2
ICP Serial Dilution Results

Sample ID	Applicable Analytes (%D>10% in bold)
SURFACE WATER –DISSOLVED FRACTION	
SFM13-6-D01N-SFW (WAT319S)	Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mn, Ni, Se, Mo, Ag, Tl, V, Zn
SFM39-4-D01N-SFW (WAT320S)	Ca
SURFACE WATER –TOTAL FRACTION	
SFM13-6-T01N-SFW (WAT319S)	Al, Fe

Table 4-3 summarizes the average % Ds for each of the analytes, broken down into total and dissolved fractions, along with the percent of applicable analytes that exceeded control criteria (10%) for surface waters, and the results qualifiers based on the collective assessment.

Table 4-3
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	# of Valid Results	#Ds >10%	Avg. %D	% Valid Result >10%	# of Valid Results	#Ds >10%	Avg. %D	% Valid Result >10%	
SURFACE WATER									
Aluminum	1	0	2.3	0	1	0	2.0	0	NQ
Antimony	0	0	---	---	1	0	3.0	0	
Arsenic	0	0	---	---	1	0	3.5	0	
Barium	0	0	---	---	1	0	5.0	0	
Beryllium	0	0	---	---	1	0	5.6	0	
Boron	0	0	---	---	1	0	5.0	0	
Cadmium	0	0	---	---	1	0	4.0	0	
Calcium	0	0	---	---	2	0	4.7	0	
Chromium	0	0	---	---	1	0	0.2	0	

Table 4-3
ICP Serial Dilution Overall Assessment

Analyte	Total				Dissolved				Action
	# of Valid Results	#Ds >10%	Avg. %D	% Valid Result >10%	# of Valid Results	#Ds >10%	Avg. %D	% Valid Result >10%	
Cobalt	0	0	---	---	1	0	1.3	0	
Copper	0	0	---	---	1	0	2.1	0	
Iron	1	0	2.4	0	1	0	8.0	0	
Lead	0	0	---	---	1	0	3.9	0	
Magnesium	0	0	---	---	0	0	---	---	
Manganese	0	0	---	---	1	0	1.4	0	
Molybdenum	0	0	---	---	1	0	0.8	0	
Nickel	0	0	---	---	1	0	2.7	0	
Potassium	0	0	---	---	0	0	---	---	
Selenium	0	0	---	---	1	0	6.3	0	
Silver	0	0	---	---	1	0	1.6	0	
Sodium	0	0	---	---	0	0	---	---	
Thallium	0	0	---	---	1	0	3.2	0	
Vanadium	0	0	---	---	1	0	0.6	0	
Zinc	0	0	---	---	1	0	6.2	0	

NQ = No Qualification

4.3.1 Surface Water

No sample results were qualified on the basis of serial dilution results, as all %Ds analytes applicable to the dilution study were less than 10%.

Site-specific field duplicate samples, rinsate blanks, and field blanks were assessed collectively by matrix for the surface water samples associated with the September 2004 Radon Study to determine the need for qualification of sample results of similar matrices. The sections to follow summarize the results for these QC samples and any collective qualifications arising from the assessments.

5.1 FIELD DUPLICATE AGREEMENT

The field duplicate agreement assessment evaluated the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, as follows. When both concentration results were sufficiently greater (5x) the CRDL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤25%. If one or both of the concentration results were less than 5x the CRDL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤2x the CRDL. Again, the frequency of the field duplicate samples followed the frequency of matrix spike and laboratory duplicate analyses, as the same samples were designated for all QC parameters.

All field duplicate results met the criteria specified in SOP 12.1. As such, data qualification on the basis of field duplicate results was not necessary for any samples. Based on the field duplicate results, the overall level of sampling and analysis precision demonstrated is considered to be acceptable.

5.2 RINSATE BLANK RESULTS

Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. Rinsate blanks are prepared in an identical manner to the samples with which they are associated. The QAPP required frequency of 5% for the collection of rinsate blanks was met for the surface waters associated with the September 2004 Radon Study.

Table 5-1 summarizes the analytes detected in the associated RI/FS rinsate blank sample. This table does not include detections for analytes that were qualified as nondetect on the basis of method blank or continuing calibration blank contamination. As such, the table lists only the analytes for which it may have been necessary to qualify other sample results.

Table 5-1
Summary of Rinsate Blank Results and Additional Qualifications

Analytes	RL (mg/L)	# Detections	Total # Samples	% Detections	Average Conc. (mg/L)	5x Average Conc. (mg/L)	Concentration Range for Field Samples (mg/L)	Action
SURFACE WATER- TOTAL FRACTION								
Chloride	0.20	1	1	100	0.28	1.4	2.3-2.9	All sample results greater than qualification threshold
BAlk	1.0	1	1	100	2.9	14.5	62.6-72.3	
TAlk	1.0	1	1	100	2.9	14.5	62.6-72.3	
SURFACE WATER- DISSOLVED FRACTION								
Zinc	1.9 (µg/L)	1	1	100	2.7	13.5	13.2-56.5	SFM39-2-D01N-SFW→ U RB-I

BAlk = Bicarbonate Alkalinity
TAlk = Total Alkalinity

To mitigate the potential effects of cross contamination in reported sample results, data qualification as nondetect was issued to sample results less than the calculated criteria concentration. Only one sample result (zinc in SFM39-2-D01N-SFW) was qualified as nondetect at the reported concentration on the basis of rinsate blank contamination. The rinsate blank results are indicative of acceptable decontamination procedures as detections were infrequent and at low levels.

All data were considered acceptable for use in meeting project objectives as qualified. Multiple sample results were qualified as nondetect on the basis of laboratory blank or rinsate blank contamination. Lastly, several data results were qualified as estimated on the basis of holding time exceedances. The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a RPD or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment

Analysis Type	QC Measure	# of Measurements	# Within Criteria	% Results within Criteria
SURFACE WATER				
Inorganics	FD	15	15	100
	LD	15	15	100
Total Metal*	FD	3	3	100
	LD	3	3	100
Dissolved Metals	FD	25	25	100
	LD	25	25	100

*Total metal analytes include aluminum, iron and cyanide

The percentage of acceptable precision measurements was 100% for all parameters. The overall level of precision demonstrated for all analyses collectively was considered to be acceptable.

6.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. These measurements were expressed as percent recoveries for MS samples, summarized in Table 6-2. Results for laboratory control samples (LCS) were not reviewed at the level of sample specific review unless the laboratory case narrative noted any LCS recoveries outside the acceptance range of 75-125%, or unacceptable LCS recoveries were discovered upon review of laboratory performance parameters.

Table 6-2
Summary of Accuracy Assessment

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
SURFACE WATER				
Inorganics	MS	9	9	100
Metals	MS	28	28	100

The percentage of acceptable accuracy measurements was 100% for all parameters. The overall level of accuracy with respect to the site matrix demonstrated for all analyses collectively was considered to be acceptable.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results were considered usable as qualified for meeting project objectives. The QAPP completeness goal of 80% was met.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting Field Sampling Plan (FSP) and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the surface water samples collected in association with the September 2004 Radon Tracer Study. The close agreement between the field duplicate results, as discussed in Section 5.1, indicated that the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Section 5.2 indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following SOPs to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analytes. Where possible, the laboratory submitted data from lesser dilutions (for organic analyses), thereby achieving detection limits for non-detects, as specified in the QAPP. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit (MRL) requirements for all metals. Selected ICP analyses and all ICP/MS analyses were performed at dilutions to eliminate or minimize matrix interferences for certain metals. While it is anticipated that all non-rejected data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.

Attachments

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT319S

Sampling Events: Chemical Analyses associated with the Radon Study

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? Yes

Data Reviewer: Jennifer Winnike

Date Completed: 12/07/04

Peer Reviewer: Stacey Coker

Date Completed: 12/08/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals[2]	Inorganics
SFM13-1-T01N-SFW	SA	591507		W	X	X
SFM13-1-D01N-SFW	SA	591508		W	X	
SFM13-2-T01N-SFW	SA	591509		W	X	X
SFM13-2-D01N-SFW	SA	591510		W	X	
SFM13-4-T01N-SFW	SA	591511		W	X	X
SFM13-4-D01N-SFW	SA	591512		W	X	
SFM13-3-T01N-SFW	SA	591513		W	X	X
SFM13-3-D01N-SFW	SA	591514		W	X	
SFM13-3-T01D-SFW	FD	591515		W	X	X
SFM13-3-D01D-SFW	FD	591516		W	X	
SFM13-5-T01N-SFW	SA	591517		W	X	X
SFM13-5-D01N-SFW	SA	591518		W	X	
SFM13-6-T01N-SFW	SA, MS, LD	591519		W	X	X
SFM13-6-D01N-SFW	SA, MS, LD	591520		W	X	
SFM39-1-T01N-SFW	SA	591521		W	X	X
SFM39-1-D01N-SFW	SA	591522		W	X	
SFM39-2-T01N-SFW	SA	591523		W	X	X
SFM39-2-D01N-SFW	SA	591524		W	X	
SFM39-3-T01N-SFW	SA	591525		W	X	X
SFM39-3-D01N-SFW	SA	591526		W	X	

Matrix: W = Water

QC Type: SA = Sample MS = Matrix Spike LD = Laboratory Duplicate

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Total metals includes Aluminum and Iron only

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	No	Several samples were received one day past the prescribed holding time for nitrite and orthophosphate. Table 1 summarizes the samples that exceeded holding time and the resultant data qualifications.
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD SFM13-6-T01N-SFW SFM13-6-D01N-SFW LD SFM13-6-T01N-SFW SFM13-6-D01N-SFW	Yes	All matrix QC results were within evaluation criteria, therefore, no qualifications of date were necessary. The matrix quality control results for the September Chemical Analyses Associated with the Radon Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution SFM13-6-T01N-SFW SFM13-6-D01N-SFW Total vs. Partial Analyses Cation/Anion Balance Internal Standards	Yes	The serial dilution analyses were run on samples SFM13-6-T01N-SFW and SFM13-6-D01N-SFW. For sample SFM13-6-T01N-SFW, the serial dilution results were applicable for both analytes reported. For sample SFM13-6-D01N-SFW, the serial dilution results were applicable for 21 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. No qualifications of data were necessary. The serial dilution results for the September Chemical Analyses Associated with the Radon Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5. No qualification was necessary on the basis of cation/anion or TDS ratio imbalances.
Field QC Field Duplicate SFM13-3-T01D-SFW SFM13-3-D01D-SFW Rinsate Blank RB01T-SFW RB01D-SFW	Yes	All field duplicate results were within criteria. No qualifications of data were necessary. The field QC results for the September Chemical Analyses Associated with the Radon Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The rinsate blank detections will be assessed collectively with all other rinsate blank results to determine the need for qualification.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the chemical analyses associated with the radon study.
Package Completeness	Yes	
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	N/A	

Review Parameter	Criteria Met?	Comments
Laboratory-specific Parameters	Complete with "Yes", "No", or "Not Applicable (NA)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Initial Calibration	Yes	
Continuing Calibration	Yes	During the TOC analysis of 10/27/04, the calibration check standards designated as CCV2 (84%)and CCV3 (114%) yielded percent recoveries that were outside control criteria. Since the samples in this SDG were not associated with these two CCVs, no qualifications of data were necessary.
Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) Results	Yes	
Compound Identification	N/A	
Quantification	Yes	For the ICP/MS analyses, the laboratory results could not be reproduced exactly by using routine data validation procedures (i.e., generating a calibration equation by linear regression and subsequently calculating the sample concentrations). The laboratory stated the discrepancy was due to the complex algorithms used by the instrument software. According to the instrument manufacturer, this includes interpolating internal standards, forcing through the blank, weighting the calibration points, and correcting for external drift. These calculations cannot be easily duplicated manually. Since the difference between the reported results and the reviewer's calculated results was reasonably small (except at very low concentrations, which are intrinsically high in uncertainty), and since the method and instrument QC results were within the acceptance limits for all the ICP/MS metals, no action was taken.
Verification	Yes	
Method Specific QC Thermal stability Tuning/Mass Calibration Resolution ICS	No	The ICP-MS peak height, width, resolution and mass calibration to 0.1 amu were not evaluated because the STL ICP-MS software is unable to produce documentation to support this evaluation. Acceptable performance is inferred from ongoing acceptable QC sample results.

Table 1
Holding Time Qualifications for Inorganics

Sample	Nitrite (mg/L)	Orthophosphate (mg/L)
SFM13-1-T01N-SFW	0.0050 UJ	0.010 UJ
SFM13-2-T01N-SFW	0.0050 UJ	0.010 UJ
SFM13-4-T01N-SFW	0.0050 UJ	0.010 UJ
SFM13-3-T01N-SFW	0.0050 UJ	0.010 UJ
SFM13-3-T01D-SFW	0.0050 UJ	0.010 UJ
SFM13-5-T01N-SFW	0.0050 UJ	0.010 UJ
SFM13-6-T01N-SFW	0.0050 UJ	0.010 UJ

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	CCB7 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	0.6	0.6	0.7	0.6	0.7	0.7	0.7	0.358	0.30	SFM13-1-D01N-SFW SFM13-2-D01N-SFW SFM13-3-D01D-SFW SFM13-3-D01N-SFW SFM13-4-D01N-SFW SFM13-5-D01N-SFW SFM13-6-D01N-SFW SFM39-1-D01N-SFW SFM39-2-D01N-SFW SFM39-3-D01N-SFW	U CCB, MB-I
Cadmium	01	01	01	0.1	0.1	0.1	0.1	0.252	0.10	SFM13-1-D01N-SFW SFM13-2-D01N-SFW SFM13-3-D01D-SFW SFM13-3-D01N-SFW SFM13-4-D01N-SFW SFM13-5-D01N-SFW SFM13-6-D01N-SFW SFM39-1-D01N-SFW SFM39-2-D01N-SFW SFM39-3-D01N-SFW	U CCB, MB-I
Chromium	-2.6	-1.7	-3.5	-3.7	---	---	---	-3.064	1.1	SFM13-1-D01N-SFW SFM13-2-D01N-SFW SFM13-3-D01D-SFW SFM13-3-D01N-SFW SFM13-4-D01N-SFW SFM13-5-D01N-SFW SFM13-6-D01N-SFW SFM39-1-D01N-SFW SFM39-2-D01N-SFW SFM39-3-D01N-SFW	UJ CCB, MB-L
Copper	-1.4	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3	-0.775	0.30	SFM13-1-D01N-SFW SFM13-2-D01N-SFW SFM13-3-D01D-SFW SFM13-3-D01N-SFW SFM13-4-D01N-SFW SFM13-5-D01N-SFW SFM13-6-D01N-SFW	J CCB-L
										SFM39-1-D01N-SFW SFM39-2-D01N-SFW SFM39-3-D01N-SFW	J CCB, MB-L
Iron	---	53.2	---	---	---	---	---	---	35.5	SFM13-1-D01N-SFW SFM13-1-T01N-SFW SFM13-2-D01N-SFW SFM13-2-T01N-SFW SFM13-3-D01D-SFW SFM13-3-D01N-SFW SFM13-3-T01D-SFW SFM13-3-T01N-SFW SFM13-4-D01N-SFW SFM13-4-T01N-SFW SFM13-5-D01N-SFW SFM13-5-T01N-SFW SFM13-6-D01N-SFW	U CCB-I
Molybdenum	1.2	0.9	0.9	0.9	0.9	0.9	0.9	0.715	0.40	SFM13-1-D01N-SFW SFM13-2-D01N-SFW SFM13-3-D01D-SFW SFM13-3-D01N-SFW SFM13-4-D01N-SFW SFM13-5-D01N-SFW SFM13-6-D01N-SFW SFM39-1-D01N-SFW SFM39-2-D01N-SFW SFM39-3-D01N-SFW	U CCB, MB-I

Table 2
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	CCB5 (µg/l)	CCB6 (µg/l)	CCB7 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Selenium	---	0.4	---	---	---	---	---	---	0.30	SFM13-4-D01N-SFW SFM13-6-D01N-SFW	U CCB-I
Silver	-0.1	-0.1	-0.1	---	-0.1	---	---	---	0.10	SFM13-1-D01N-SFW SFM13-2-D01N-SFW SFM13-3-D01D-SFW SFM13-3-D01N-SFW SFM13-4-D01N-SFW	UJ CCB-L
Vanadium	0.1	---	-0.2	0.1	---	0.2	---	0.128	0.10	SFM13-1-D01N-SFW SFM13-2-D01N-SFW SFM13-3-D01D-SFW SFM13-3-D01N-SFW SFM13-4-D01N-SFW SFM13-5-D01N-SFW SFM13-6-D01N-SFW SFM39-2-D01N-SFW SFM39-3-D01N-SFW	U CCB, MB-I

CCBx-Continuing Calibration Blank RL= IDL= Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS
DATA REVIEW SUMMARY

Data Package Number: WAT320S

Sampling Events: Chemical Analyses Associated with the Radon Study

Matrix: Solid ___ Water _X_ Biota ____

Sample-specific Parameter Review? Yes

Laboratory Performance Parameters? No

Data Reviewer: Jennifer Winnike

Date Completed: 11/09/04

Peer Reviewer: Stacey Coker

Date Completed: 12/03/04

The table below summarizes the results presented in this data package.

Field ID	QC Type [1]	Lab ID	CLP Form Field ID Abbreviation	Matrix	Analyses	
					Metals[2]	Inorganics[2]
SFM39-4-T01N-SFW	SA	591593		W	X	X
SFM39-4-D01N-SFW	SA	591594		W	X	
SFM39-5-T01N-SFW	SA	591595		W	X	X
SFM39-5-D01N-SFW	SA	591596		W	X	
SFM39-6-T01N-SFW	SA	591597		W	X	X
SFM39-6-D01N-SFW	SA	591598		W	X	
SFM39-7-T01N-SFW	SA	591599		W	X	X
SFM39-7-D01N-SFW	SA	591600		W	X	
SFM39-8-T01N-SFW	SA	591601		W	X	X
SFM39-8-D01N-SFW	SA	591602		W	X	
RB01T-SFW	SA	591603		W	X	X
RB01D-SFW	SA	591604		W	X	

Matrix: W = Water

QC Type: SA = Sample

[1]The matrix code at the end of the field ID indicates the sample matrix that the QC blank is associated with.

[2]Total metals includes Aluminum and Iron only

The data review was conducted in accordance with SOP 12.1, Data Validation of RI/FS Data. The table following the case narrative summary presents the results of the review and any qualified data. Results are only detailed in the comment section if they fell outside review criteria.

Case Narrative Summary: All issues, potentially affecting the quality or usability of the data, noted in the laboratory case narrative are addressed in the table below.

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
COC & Sample Receipt	Yes	
Holding Times	Yes	
Method Blanks	No	Various metals were detected in the metal preparation blank and continuing calibration blanks. Table 1 summarizes the blank detections and the resultant data qualifications.
Matrix QC MS/MSD LD	N/A	Matrix QC samples were not analyzed with this SDG. The matrix quality control results for the September Chemical Analyses Associated with the Radon Study will be evaluated collectively and any additional data qualification will be summarized in the overall assessment.
Method QC Surrogates Serial Dilution SFM39-4-D01N-SFW Total vs. Partial Analyses Cation/Anion Balance Internal Standards	No	The serial dilution analyses was run on sample SFM39-4-D01N-SFW. The serial dilution results were only applicable for 1 of the 24 analytes. The majority of the analytes were not applicable due to the fact that the initial sample concentrations were less 50x than the IDL, adjusted for dilution. The percent differences (between initial and serial dilution results) were reviewed for any in excess of 10%. No qualifications of data were necessary. The serial dilution results for the September Chemical Analyses Associated with the Radon Study will be evaluated collectively and any resultant data qualification will be summarized in the associated overall assessment for water samples. The laboratory-generated cation/anion balances were compared against an evaluation criterion of ±13% to assess the usability of data. All reported cation/anion balances met this criterion, with the exception sample RB01T/D-SFW which had a balance of –50.42%. As the concentration were low enough that the reporting limits controlled the calculations, the cation/anion % difference was not representative of this comparison and therefore did not result in data qualification. The ratios of the calculated versus measured TDS for all field samples were within 0.5 and 1.5, with the exception of rinsate blank sample RB01T/D-SFW which reported a TDS ratio of 2.14 respectively. The elevated TDS ratio indicated the TDS calculated concentration was high relative to the measured TDS concentrations. The concentration in this sample was low enough that the reporting limit controlled the calculation. The TDS ratio was therefore not an appropriate measure of accuracy for this sample. No qualification was considered necessary.
Field QC Field Duplicate Rinsate Blank RB01T-SFW RB01D-SFW	N/A	Field QC samples were not analyzed with this SDG. The field QC results for the September Chemical Analyses Associated with the Radon Study will be evaluated collectively and any resultant data qualification will be summarized in the overall assessment. The rinsate blank detections will be assessed collectively with all other rinsate blank results to determine the need for qualification.
Nondetect Results w/ Elevated RLs?	No	Based on anion-cation balance evaluations, serial dilution results, and comparisons to historic data, URS and the laboratory discovered a systematic pH-dependent matrix effect resulting in a low bias to metals results in many aqueous analyses at the site. A dilution scheme was developed by the laboratory, which was designed to eliminate this matrix effect. Separate dilution schemes were developed for samples with pH greater than 5.6 and those less than 5.6. Generally greater dilutions were found to be required for the acidic samples. All other instances of non-detect results with elevated RLs were due to results qualified as non-detect on the basis of blank results. In these cases, the RL was raised to the reported value. However, the dilution scheme used routinely for the RI/FS was modified slightly for the chemical analyses associated with the radon study.
Package Completeness	Yes	

Review Parameter	Criteria Met?	Comments
Sample-specific Parameters	Complete with "Yes", "No", or "Not Applicable (N/A)".	For each "No" response, list what was out, associated acceptance limits, all qualified data, and bias direction or reference associated table with pertinent details.
Other parameters evaluated based on case narrative comments or review of laboratory performance parameters.	Yes	Based on the results of the evaluation of laboratory performance parameters conducted on other packages, the following laboratory performance parameters were evaluated from the summary forms: • Metals: Interference Check Sample Results. As none of the "on-instrument" concentrations of interferent elements were equal to or exceeded the concentrations present in the ICS solution, the ICS evaluation was not necessary. • All Parameters: Laboratory Control Sample (LCS). All recoveries were within acceptance limits, therefore, no qualifications of data were necessary.

Table 1
Blank Detections Resulting in Qualification

Analyte	CCB1 (µg/l)	CCB2 (µg/l)	CCB3 (µg/l)	CCB4 (µg/l)	MB (µg/l)	IDL	Samples Qualified	Qualification Code
Antimony	1.7	1.6	1.7	1.7	1.436	0.30	RB01D-SFW SFM39-4-D01N-SFW SFM39-5-D01N-SFW SFM39-6-D01N-SFW SFM39-7-D01N-SFW SFM39-8-D01N-SFW	U CCB, MB-I
Chromium	1.2	---	---	---	---	1.1	SFM39-4-D01N-SFW SFM39-5-D01N-SFW	U CCB-I
Copper	-0.6	-0.6	-0.7	-0.6	-0.482	030	RB01D-SFW SFM39-4-D01N-SFW SFM39-5-D01N-SFW SFM39-6-D01N-SFW SFM39-7-D01N-SFW SFM39-8-D01N-SFW	J/UJ CCB, MB-L
Iron	50.3	---	---	---	---	35.5	SFM39-5-D01N-SFW	U CCB-I
Molybdenum	---	---	---	-0.4	-0.535	0.40	RB01D-SFW SFM39-4-D01N-SFW SFM39-5-D01N-SFW SFM39-6-D01N-SFW SFM39-7-D01N-SFW SFM39-8-D01N-SFW	J/UJ CCB, MB-L
Selenium	---	---	---	-0.3	-0.316	0.30	RB01D-SFW SFM39-4-D01N-SFW SFM39-5-D01N-SFW SFM39-6-D01N-SFW SFM39-7-D01N-SFW SFM39-8-D01N-SFW	UJ CCB, MB-L

CCBx-Continuing Calibration Blank IDL = Instrument Detection Limit

Note: Table limited to blank detections resulting in qualification. As such, all blank detections may not be listed.

MOLYCORP RI/FS DATA VALIDATION REPORT FOR THE FRONT ROCK PILE CHARACTERIZATION SAMPLING EVENT DATA SUMMER 2005

Prepared for

Molycorp, Inc.
Questa, New Mexico

September 2005

URS

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142571

TABLE OF CONTENTS

Section 1 Introduction 1-1

Section 2 Data Review Process 2-1

Section 3 Data Review Commentary 3-1

3.1 Data Review Narratives 3-1
3.2 General Data Quality Issues 3-1
3.2.1 Matrix Spikes 3-1
3.2.2 Laboratory Performance Review (LPR) Findings 3-1
3.2.3 Metals Analyte Lists 3-1

Section 4 Collective Assessment of Matrix QC Results 4-1

4.1 Matrix Spike Results (Accuracy Evaluation) 4-3
4.2 Laboratory Duplicate Results (Precision Evaluation) 4-10
4.3 ICP Serial Dilution Results 4-10

Section 5 Field Quality Control Results 5-1

5.1 Field Duplicate Agreement 5-1

Section 6 Overall Data Quality Assessment 6-1

6.1 Precision 6-1
6.2 Accuracy 6-1
6.3 Completeness 6-2
6.4 Representativeness 6-2
6.5 Comparability 6-2
6.6 Sensitivity 6-2

TABLE OF CONTENTS

List of Tables

Table 1-1 Summary of Rock Pile Samples and Analyses

Table 4-1 Field Samples Used for Matrix QC Analysis

Table 4-2 Frequency for Matrix QC Analyses

Table 4-3 Inorganics Matrix Spike Results

Table 4-4 Metals Matrix Spike Results

Table 4-5 Summary of Metals Laboratory Duplicate Exceedances

Table 4-6 ICP Serial Dilution Overall Assessment

Table 5-1 Summary of Inorganic Field Duplicate Exceedances

Table 5-2 Summary of Metals Field Duplicate Exceedances

Table 5-3 Summary of ABA Field Duplicate Exceedances

Table 6-1 Summary of Precision Assessment

Table 6-2 Summary of Accuracy Assessment

List of Attachments

Attachment 1.1 Data Review Summary for Data Package 117934

Attachment 1.2 Data Review Summary for Data Package 117935

Attachment 1.3 Data Review Summary for Data Package 117936

Attachment 1.4 Data Review Summary for Data Package 117937

Attachment 1.5 Data Review Summary for Data Package 117938

Attachment 1.6 Data Review Summary for Data Package 117967

Attachment 1.7 Data Review Summary for Data Package 117968

Attachment 1.8 Data Review Summary for Data Package 117969

Attachment 1.9 Data Review Summary for Data Package 117970

Attachment 1.10 Data Review Summary for Data Package 117971

Attachment 1.11 Data Review Summary for Data Packages 117759, 117760, and 117818 (Acid-Base Accounting data sets)

Attachment 1.12 Data Review Summary for Data Package 108674

Attachment 1.13 Data Review Summary for Data Package 108705

This Data Validation Report (DVR) provides a general overview of the usability of the leachate chemical analytical data obtained during the Front Rock Pile Characterization sampling event at Molycorp Questa Mine in Questa, New Mexico. This report contains the results and describes the process of the sample specific data reviews and collective evaluations for the Rock Pile samples collected in support of the Remedial Investigation/Feasibility Study (RI/FS) during the month of July, 2005.

Rock Pile samples were submitted to SVL Analytical in Kellogg, Idaho and to Severn Trent Laboratories (STL) in Colchester, Vermont for leaching and chemical analysis. The number of samples collected and analyses conducted were in accordance with the Draft Final Addendum 2, Molycorp RI/FS Quality Assurance Project Plan – Appendix A - Field Sampling Plan, Rock Pile Characterization Work Plan. The analytical methods utilized were according to the RI/FS Quality Assurance Project Plan, Revision 1.0 (QAPP). Sample and QC results were reported in 15 original packages.

Table 1-1 summarizes the Rock Pile samples collected during this sampling event, along with the analyses performed on each sample and the accompanying QC samples.

Table 1-1
Summary of Rock Pile Samples and Analyses

Leaching Procedure(1)	None	FLT		18 Hour		Shake Flask		3:1 SPLP		2:1 SPLP		SPLP		None	
Sample Identification	ABA	Met(2)	Inorg(2)	Met	Inorg	Met	Inorg	Met	Inorg	Met	Inorg	Met	Inorg	Met	Inorg / Misc
SI50-T01N-MINE-AND	XD	X	XMD	XMD	XMD	XD	XMD	XMD	XMD	XMD	XMD	XMD	X	XMD	X
SI50-T02N-MINE-AND	X	XD	X	X	X	XM	X	XMD	X	XM	X	XMD	X	X	X
SI50-T03N-MINE-RHY	X	XM	X	X	X	X	X	X	X	X	X	X	X	X	X
SI50-T04N-MINE-AND	X	XM	X	X	X	XMD	X	X	X	X	X	X	X	X	X
SI50-T05N-COL	X	XD	X	X	X	X	X	X	X	X	X	X	X	X	X
SI50-T06N-COL	X	XM	X	X	X	X	X	X	X	X	X	X	X	X	X
SI50-T07N-BED	X	X	X	X	X	X	X	X	X	X	X	X	XMD	X	X
SSSWOUT-T01N-SCAR(3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SSSWOUT-T01D-SCAR(3)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SI48B-T01N-MINE-APL	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SI45B-T01N-MINE-AND	X	XM	XM	XM	XM	XM	XM	XM	XM	XM	XM	X	X	X	X
SI45B-T02N-MINE-MV	X	XM	X	X	X	X	X	X	X	X	X	X	X	X	X
SI45B-T03N-MINE-MV	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SI45B-T05N-COL	X	X	X	X	X	X	X	X	X	X	X	X	XMD	X	X
SI45B-T06N-BED	X	X	X	X	X	XM	X	X	X	X	X	X	X	X	X
SI44B-T01N-MINE-AND	XD	X	XMD	XMD	XMD	XMD	XMD	X	XMD	XMD	XMD	X	X	X	XMD
SI44B-T02N-WBED	X	XD	X	X	X	XM	X	XMD	X	X	X	XMD	X	X	X
SI51B-T01N-MINE-MV	X	X	X	X	X	X	X	X	X	XMD	X	XMD	X	X	X
SI51B-T03N-COL	X	XM	X	X	X	X	X	XD	X	X	X	X	X	X	X
SI51B-T05N-COL	X	XD	X	X	X	X	X	XM	X	X	X	X	XMD	X	X
SI51B-T07N-BED	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SI52B-T01N-MINE-AND	X	XM	X	X	X	X	X	X	X	X	X	X	X	X	X
SI52B-T02N-MINE-MV	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SI52B-T03N-COL	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SI52B-T04N-BED	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SGSDF1-T01N-DEBRIS	X	XM	XM	XM	XM	XM	XM	XM	XM	XM	XM	X	X	X	X
SGSDF1-T02N-DEBRIS(3)	X	XM	X	X	X	X	X	X	X	X	X	X	X	X	X
SGSDF1-T03N-DEBRIS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XMD
SI51B-T02N-COL	X	X	X	X	X	X	X	X	X	X	X	XMD	X	X	X

Table 1-1
Summary of Rock Pile Samples and Analyses

Leaching Procedure(1)	None	FLT		18 Hour		Shake Flask		3:1 SPLP		2:1 SPLP		SPLP		None	
Sample Identification	**ABA**	**Met(2)**	**Inorg(2)**	**Met**	**Inorg**	**Met**	**Inorg**	**Met**	**Inorg**	**Met**	**Inorg**	**Met**	**Inorg**	**Met**	**Inorg / Misc**
GHGDF1-T01N-DEBRIS	XD	X	X	X	X	X	X	X	X	X	X	X	X	X	X
GHGDF1-T02N-DEBRIS	X	X	X	X	X	X	X	X	X	X	X	X	X	XMD	X
SGSDF1-T02D-DEBRIS(3)	X	X	X	X	X	X	X	X	X	X	X	X	XMD	X	X
Number of primary samples	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Number Field Duplicates	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

X = Analysis performed M = Matrix Spike performed D = Laboratory Duplicate & Serial Dilution performed

(1) FLT = Field Leach Test (5 minutes) with DI water, 20:1 liquid-to-solid ratio
18 Hr = Continuation of FLT for 18 hours
Shake Flask = 24 hour leaching with DI water, 3:1 liquid-to-solid ratio
3:1 SPLP = Modified SPLP with NV MWMP reagent, 3:1 liquid-to-solid ratio
2:1 SPLP = Modified SPLP with NV MWMP reagent, 2:1 liquid-to-solid ratio
SPLP = Normal SPLP, extraction fluid #2, 20:1 liquid-to-solid ratio
None = No leaching; analyses performed on a total basis

(2) ABA = Acid Base Accounting
Met = TAL Metals less Hg, plus Mo, B, and Si (SPLP and total basis analyses included Hg)
Inorg = pH, conductivity, chloride, fluoride, and sulfate; total basis inorganics are chloride, fluoride, and sulfate only, plus percent solids
Misc = Percent solids and particle size (hydrometer only)

(3) Samples SSSWOUT-T01N-SCAR and SSSWOUT-T01D-SCAR and samples SGSDF1-T02N-DEBRIS and SGSDF1-T02D-DEBRIS were field duplicates.

The data review process included evaluation of sample-specific and laboratory performance criteria in accordance with the standard operating procedure (SOP) 12.1. As specified in the SOP, all RI/FS data generated for the Questa Mine received an evaluation of sample-specific parameters. In addition, 10% of the data packages (per analysis type per event/episode) were reviewed for laboratory performance parameters. The hierarchy for acceptance criteria used to evaluate each parameter, as specified in SOP 12.1, was initially to follow the criteria specified in the RI/FS QAPP (SOP 12.1), then method specified criteria if criteria were not specified in the QAPP, and lastly (if prior references did not specify the criteria in question), laboratory-determined historical acceptance ranges.

Sample-specific reviews included evaluation of the following sample-related parameters:

- Case narrative comments
- Chain-of-Custody/Sample Receipt
- Holding Times
- Method Blank (Preparation Blank)
- Matrix-Dependent Quality Control
  - Matrix Spike Analysis
  - Laboratory duplicate Analysis
- Method-Specific Quality Control Measures
  - Inorganic Method Specific QC Measures
    - Post Digestion Spike Analysis
    - ICP Serial Dilution Tests
    - Internal Standard Performance
- Field quality control samples
  - Field Duplicate Agreement

Evaluation of laboratory performance parameters provided an overall representation of the analytical system at the time the samples were analyzed. The laboratory performance review evaluated parameters in control of the laboratory, but independent of the field samples analyzed, as follows:

- Interference Check Standard
- Initial Calibration
- Continuing Calibration Verification
- Laboratory Control Sample Analysis
- Compound Identification
- Target Analyte Quantification
- Verification

- Method Specific Quality Control Check

If any potentially systematic problems were determined upon review of the laboratory performance parameters in any of the selected packages evaluated (meeting the 10% criteria), the review parameter was evaluated in all data packages to determine the need for data qualification. For instances in which professional judgment was exercised in evaluating the need for data qualification, the rationale for such qualification was provided in the data review summary.

Upon completion of the sample-specific reviews and laboratory performance reviews, a collective assessment for the event was performed. Site-specific matrix spike, laboratory duplicate, serial dilution, and field duplicate results were assessed collectively by matrix per event to determine the need for qualification of sample results of similar matrix. Due to the differences in the various leaching techniques used to analyze the Rock Pile samples, the leachates produced by each technique were considered a unique matrix for the purposes of the collective assessment.

EPA's SW-846 methods specify that QC such as matrix spikes should be analyzed at a frequency of one per batch of 20 samples, even if samples in the batch are from multiple sites. Thus, the QC samples analyzed within a given data package are often not representative of the site matrix. Site-specific QC samples are considered more representative of the site sample matrix and a good indication of whether there is a matrix effect present affecting samples of similar matrix. Therefore, samples were designated on the COC that were to be run as site-specific QC samples to meet the frequency of site-specific QC specified in the RI/FS QAPP. Although each data package contained at least one set of site-specific QC samples, only the specific samples used for the QC measure (parent samples) were qualified based on exceedances identified during the individual package data reviews. A collective evaluation of all of the site-specific QC samples for each matrix was performed to determine whether or not problems identified in a given QC sample are generally true for all site-specific samples of that matrix or are likely limited to the parent sample. If the matrix effect was judged to be generally present for a given matrix, then qualification of all results for samples of that matrix was performed. If the matrix effect was judged to be limited to the specific sample used for the QC measure, then qualification of only this parent sample was considered warranted.

Section 3.0 describes the laboratory performance and sample specific data review findings and several data quality issues affecting all of the Rock Pile leachate analysis data packages. Section 4.0 presents the collective assessment of the matrix QC results (matrix spike, laboratory duplicate, and serial dilution results) and associated sample qualification. Section 5.0 summarizes the collective summary of the field QC results (field duplicate results) and the resultant sample qualification. Lastly, an overall assessment of data, with respect to the PARCC parameters (precision, accuracy, representativeness, comparability and completeness) and sensitivity, is presented in Section 6.0.

3.1 DATA REVIEW NARRATIVES

Attachment 1 includes all individual data review summaries for data packages 117934 through 117938, 117967 through 117971, 117759, 117760, 117818, 108674, and 108705, for a total of 15 original data packages. In order to meet the frequency requirements for laboratory performance reviews, three data packages (117937, 117759, and 108674) were evaluated for laboratory performance criteria. Results of the laboratory performance reviews are summarized in the individual data review summary reports. The electronic database contains the finalized qualified data, including the reason codes and bias directions assigned. Data sheets marked with assigned data qualifiers and qualifier reason codes are retained in the project files.

3.2 GENERAL DATA QUALITY ISSUES

During the data review process, several data quality issues were identified which potentially affected all Rock Pile leachate samples analyzed. Although most of the issues have been addressed in the individual summary reports, these common issues and conclusions are summarized below.

3.2.1 Matrix Spikes

In some cases, matrix spike analyses were not considered appropriate for assessing accuracy for sample specific matrix effects. Specifically, when the parent sample concentration was significantly greater than the spiking concentration (i.e., greater than or equal to four times the spiking concentration), the calculated spike recovery was not considered appropriate to use in assessment of accuracy.

3.2.2 Laboratory Performance Review (LPR) Findings

As mentioned previously, two data packages were given a Laboratory Performance Review to assess the performance of the laboratory for all analyses. If data qualification was required due to a specific laboratory performance parameter, and it represented a potentially a systematic issue, the parameter was evaluated in all packages for the event. The laboratory performance parameters evaluated for all packages for this event included:

- Metals Interference Check Standards (ICSs)
- General Chemistry Laboratory Control Samples (LCSs)

3.2.3 Metals Analyte Lists

STL analyzed the total basis and normal SPLP leachate samples for the complete RI/FS list of metals, which included mercury. Mercury was not, however, a target analyte for the leachates analyzed by SVL.

Inorganic parameter matrix QC consisted of matrix spike (MS), laboratory duplicate (LD), and serial dilution (SD) analyses. The site-specific matrix QC results were assessed collectively for the Rock Pile leachate samples to determine the need for qualification of sample results of similar matrix. Sections 4.1 through 4.3 present the collective matrix QC results associated with the samples in this event and the resultant data qualifiers.

Due to leachate volume constraints, not all MS, LD, and SD analyses were performed on the samples designated for matrix QC on the COC forms. Also, in many cases, matrix QC metals analyses for a given sample were performed for only a subset of the analyte list; i.e., either the ICP metals or the ICP/MS metals, and the QC analyses for the other method performed on a separate sample. As a result, the number of samples for which at least some matrix QC analyses were performed is greater than would normally be expected.

Table 4-1 itemizes the samples used for matrix QC analyses, and Table 4-2 summarizes the frequency of matrix QC analyses for each sample type.

Table 4-1
Field Samples Used for Matrix QC Analyses

Sample ID	Matrix Spikes			Lab Duplicates and Serial Dilutions		
	ICP Metals	ICP/MS Metals	Inorganics	ICP Metals	ICP/MS Metals	Inorganics
FLT Leachates						
SI50-T01N-MINE-AND			X			X
SI50-T02N-MINE-AND					X	
SI50-T03N-MINE-RHY		X				
SI50-T04N-MINE-AND		X				
SI50-T05N-COL				X		
SI50-T06N-COL	X					
SI45B-T01N-MINE-AND		X				
SI45B-T02N-MINE-MV	X					
SI44B-T01N-MINE-AND			X			
SI44B-T02N-WBED					X	
SI51B-T03N-COL		X				
SI51B-T05N-COL				X		
SI52B-T01N-MINE-AND	X		X			X
SGSDF1-T01N-DEBRIS		X	X			
SGSDF1-T02N-DEBRIS	X					
FLT Leachate Totals	**4**	**5**	**4**	**2**	**2**	**2**
18-Hour Leachates						
SI50-T01N-MINE-AND	X	X	X	X	X	X
SI45B-T01N-MINE-AND	X	X	X			
SI44B-T01N-MINE-AND	X	X	X	X	X	X
SGSDF1-T01N-DEBRIS	X	X	X			
18-Hour Leachate Totals	**4**	**4**	**4**	**2**	**2**	**2**

Table 4-1
Field Samples Used for Matrix QC Analyses

Sample ID	Matrix Spikes			Lab Duplicates and Serial Dilutions		
	ICP Metals	ICP/MS Metals	Inorganics	ICP Metals	ICP/MS Metals	Inorganics
Shake Flask Leachates						
SI50-T01N-MINE-AND			X	X		X
SI50-T02N-MINE-AND	X					
SI50-T04N-MINE-AND		X			X	
SI45B-T01N-MINE-AND	X		X			
SI45B-T06N-BED		X				
SI44B-T01N-MINE-AND	X		X	X	X	X
SI44B-T02N-WBED		X				
SGSDF1-T01N-DEBRIS	X	X	X			
Shake Flask Leachate Totals	**4**	**4**	**4**	**2**	**2**	**2**
3:1 SPLP Leachates						
SI50-T01N-MINE-AND	X		X	X		X
SI50-T02N-MINE-AND		X			X	
SI45B-T01N-MINE-AND	X	X	X			
SI44B-T01N-MINE-AND			X			X
SI44B-T02N-WBED		X			X	
SI51B-T03N-COL				X		
SI51B-T05N-COL	X					
SGSDF1-T01N-DEBRIS	X	X	X			
3:1 SPLP Leachate Totals	**4**	**4**	**4**	**2**	**2**	**2**
2:1 SPLP Leachates						
SI50-T01N-MINE-AND	X		X	X	X	X
SI50-T02N-MINE-AND		X				
SI45B-T01N-MINE-AND	X	X	X			
SI44B-T01N-MINE-AND		X	X		X	X
SI51B-T01N-MINE-MV	X			X		
SGSDF1-T01N-DEBRIS	X	X	X			
2:1 SPLP Leachate Totals	**4**	**4**	**4**	**2**	**2**	**2**
SPLP Leachates						
SI50-T07N-BED			X			X
SI45B-T05N-COL			X			X
SI50-T01N-MINE-AND		X (+Hg)			X (+Hg)	
SI50-T02N-MINE-AND	X			X		
SI51B-T05N-COL			X			X
SGSDF1-T02D-DEBRIS			X			X
SI44B-T02N-WBED	X			X		
SI51B-T01N-MINE-MV		X			X	
SI51B-T02N-COL	(Hg only)			(Hg only)		
SPLP Leachate Totals	**2**	**2**	**4**	**2**	**2**	**4**

Table 4-1
Field Samples Used for Matrix QC Analyses

Sample ID	Matrix Spikes			Lab Duplicates and Serial Dilutions		
	ICP Metals	ICP/MS Metals	Inorganics	ICP Metals	ICP/MS Metals	Inorganics
Total Basis Samples						
SI50-T01N-MINE-AND	X	X		X	X	
SI44B-T01N-MINE-AND			X			X
SGSDF1-T03N-DEBRIS			X			X
GHGDF1-T02N-DEBRIS	X	X		X	X	
Total Basis Totals	**2**	**2**	**2**	**2**	**2**	**2**

Table 4-2
Frequency for Matrix QC Analyses

Matrix	Total # Primary Samples	# MS Analyses	MS Percentage (%)	# LD / SD Analyses	LD / SD Percentage (%)
FLT Leachates	30	4 *	13.3 %	2	6.67 %
18-Hour Leachates	30	4	13.3 %	2	6.67 %
Shake Flask Leachates	30	4	13.3 %	2	6.67 %
3:1 SPLP Leachates	30	4	13.3 %	2	6.67 %
2:1 SPLP Leachates	30	4	13.3 %	2	6.67 %
SPLP Leachates	30	2 **	6.67 %	2 **	6.67 %
Total Basis Samples	30	2	6.67 %	2	6.67 %

* 5 for ICP/MS metals (16.6%) ** 4 for inorganics (13.3%)

As shown on the table above, the QAPP frequency requirement of 5% (1 per 20) for each of the matrix QC sample types was satisfied for all analyses. For the acid base accounting analyses, the matrix QC analyses includes only a laboratory duplicate; matrix spike analyses and serial dilution analyses are not pertinent. Laboratory duplicate analyses were conducted on three samples (SI50-T01N-MINE-AND, SI44B-T01N-MINE-AND, and GHGDF1-T01N-DEBRIS), satisfying the 5% frequency requirement for matrix QC analyses.

4.1 MATRIX SPIKE RESULTS (ACCURACY EVALUATION)

Matrix dependent QC samples were used to evaluate how the sample matrix affected the accuracy of the analytical results.

In general, qualification was limited to the parent sample if 25% or fewer of the applicable matrix spike recoveries were outside the acceptance range. Conversely, if more than 25% of the applicable matrix spike recoveries were outside the acceptance range, data qualification may have been extended to the remainder of the data set for the event. However, the data reviewer also took other factors into consideration such as the average matrix spike recovery, the magnitude of the exceedances, and the number of valid recoveries relative to the size of the sample set.

A few MS recoveries were outside of the acceptance limits of 75-125% for inorganics and for metals. Tables 4-3 and 4-4 summarize the inorganics and metals MS results, including the average spike recoveries, the number of high and low exceedances, the number of spikes that were considered valid, and any additional qualifications (other than those applied to the parent samples, when necessary) based on the collective review.

Table 4-3
Inorganics Matrix Spike Results

Analyte	# Valid Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
FLT Leachates					
Chloride	4	0	0	86.3	None
Fluoride	4	1	0	91.9	J MS-L to parent sample only
Sulfate	4	0	0	97.6	None
18-Hour Leachates					
Chloride	4	0	0	89.0	None
Fluoride	4	0	0	107.9	None
Sulfate	4	0	0	104.1	None
Shake Flask Leachates					
Chloride	4	0	0	97.6	None
Fluoride	4	0	1	118.1	J MS-H to parent sample only
Sulfate	4	0	0	104.9	None
3:1 SPLP Leachates					
Chloride	4	0	0	105.6	None
Fluoride	4	0	0	105.8	None
Sulfate	4	0	0	97.4	None
2:1 SPLP Leachates					
Chloride	4	1	0	93.0	J MS-L to parent sample only
Fluoride	4	0	0	107.5	None
Sulfate	4	0	0	90.0	None
20:1 SPLP Leachates					
Chloride	0	NA	NA	NA	No spikes for chloride; no qualifiers
Fluoride	0	NA	NA	NA	No spikes for fluoride; no qualifiers
Sulfate	4	0	1	181	None
Total Basis Analyses					
Chloride	0	NA	NA	NA	No spikes for chloride; no qualifiers
Fluoride	0	NA	NA	NA	No spikes for fluoride; no qualifiers
Sulfate	2	0	0	94.5	None

No global qualifications were applied to Rock Pile sample inorganic results based on the collective assessment. Table 4-3 indicates that the accuracy of the analyses relative to leachate matrix was acceptable, as all average recoveries were within the specified limits.

Table 4-4
Metals Matrix Spike Results

Analyte	# Valid Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
FLT Leachates					
Aluminum	3	0	0	100.6	None
Antimony	5	0	0	106.9	None
Arsenic	5	0	0	103.7	None
Barium	4	0	0	100.5	None
Beryllium	4	0	0	97.7	None
Boron	4	0	0	103.2	None
Cadmium	5	0	0	105.2	None
Calcium	1	0	0	98.3	None
Chromium	4	0	0	101.6	None
Cobalt	4	0	0	101.3	None
Copper	3	0	0	88.8	None
Iron	4	0	0	92.1	None
Lead	5	0	0	95.5	None
Magnesium	4	0	0	92.2	None
Manganese	3	0	0	94.3	None
Molybdenum	5	0	0	99.9	None
Nickel	4	0	0	102.5	None
Potassium	4	0	0	99.3	None
Selenium	5	0	2	**134.5**	**J MS-H for positive results NQ for nondetect results**
Silicon	4	0	0	104.5	None
Silver	5	0	0	97.0	None
Sodium	4	0	0	98.2	None
Thallium	5	0	0	98.8	None
Vanadium	4	0	0	103.1	None
Zinc	4	0	0	99.6	None
18-hour Leachates					
Aluminum	3	0	0	101.7	None
Antimony	4	0	0	106.2	None
Arsenic	4	0	**2**	118.5	**J MS-H for positive results NQ for nondetect results**
Barium	4	0	0	98.6	None
Beryllium	4	0	0	92.5	None
Boron	4	0	0	97.7	None
Cadmium	4	0	1	110.3	J MS-H to parent sample only
Calcium	0	--	--	--	--
Chromium	4	0	0	100.2	None
Cobalt	4	0	0	97.1	None
Copper	3	0	0	91.8	None
Iron	4	0	0	98.3	None
Lead	4	0	0	97.1	None
Magnesium	3	0	0	90.6	None
Manganese	2	0	0	95.9	None
Molybdenum	3	0	0	103.5	None

Table 4-4
Metals Matrix Spike Results

Analyte	# Valid Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
Nickel	4	0	0	97.9	None
Potassium	4	0	0	99.2	None
Selenium	4	0	1	122.1	J MS-H to parent sample only
Silicon	4	0	0	103.9	None
Silver	4	0	0	92.7	None
Sodium	4	0	0	102.3	None
Thallium	4	0	0	99.8	None
Vanadium	4	0	0	101.2	None
Zinc	4	0	0	95.2	None
Shake Flask Leachates					
Aluminum	1	0	0	104.9	None
Antimony	4	0	0	93.1	None
Arsenic	4	0	0	96.9	None
Barium	4	0	0	98.2	None
Beryllium	4	0	0	97.8	None
Boron	4	0	0	104.3	None
Cadmium	4	0	0	96.9	None
Calcium	0	--	--	--	--
Chromium	4	0	0	96.8	None
Cobalt	4	0	0	97.4	None
Copper	4	0	0	94.4	None
Iron	4	0	0	98.9	None
Lead	4	0	0	89.3	None
Magnesium	1	0	0	95.1	None
Manganese	1	0	0	112.3	None
Molybdenum	3	0	0	95.3	None
Nickel	4	0	0	102.3	None
Potassium	4	0	0	101.4	None
Selenium	4	0	0	106.9	None
Silicon	4	0	0	95.6	None
Silver	4	1	0	82.5	J MS-L to parent sample only
Sodium	4	0	0	105.3	None
Thallium	4	0	0	92.8	None
Vanadium	4	0	0	100.6	None
Zinc	1	0	0	104.9	None
3:1 SPLP Leachates					
Aluminum	2	0	0	99.2	None
Antimony	4	0	0	95.2	None
Arsenic	4	0	0	97.9	None
Barium	4	0	0	91.4	None
Beryllium	4	0	0	95.5	None
Boron	4	0	0	95.6	None
Cadmium	4	0	0	93.3	None
Calcium	1	0	0	87.6	None

Table 4-4
Metals Matrix Spike Results

Analyte	# Valid Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
Chromium	4	0	0	95.9	None
Cobalt	4	0	0	93.1	None
Copper	3	1	0	79.9	J MS-L to parent sample only
Iron	4	0	0	97.2	None
Lead	4	0	0	90.9	None
Magnesium	2	0	0	96.2	None
Manganese	2	0	0	101.5	None
Molybdenum	4	0	0	98.6	None
Nickel	4	0	0	95.7	None
Potassium	4	0	0	97.7	None
Selenium	4	0	0	104.2	None
Silicon	4	0	0	93.4	None
Silver	4	0	0	88.2	None
Sodium	4	0	0	98.4	None
Thallium	4	0	0	96.6	None
Vanadium	4	0	0	99.0	None
Zinc	4	1	0	87.2	J MS-L to parent sample only
2:1 SPLP Leachates					
Aluminum	2	0	0	99.8	None
Antimony	4	1	0	95.1	J MS-L to parent sample only
Arsenic	4	0	0	105.0	None
Barium	4	0	0	91.7	None
Beryllium	4	0	0	90.6	None
Boron	4	0	0	93.0	None
Cadmium	4	0	0	104.6	None
Calcium	0	--	--	--	--
Chromium	4	0	0	95.1	None
Cobalt	4	0	0	94.0	None
Copper	3	2	0	**66.1**	**J MS-L for all results**
Iron	4	0	0	97.1	None
Lead	4	0	0	99.3	None
Magnesium	2	0	0	97.0	None
Manganese	1	0	0	88.4	None
Molybdenum	3	0	0	104.3	None
Nickel	4	0	0	94.3	None
Potassium	4	0	0	94.0	None
Selenium	4	0	1	119.8	J MS-H to parent sample only
Silicon	4	0	0	90.6	None
Silver	4	0	0	93.9	None
Sodium	4	0	0	99.1	None
Thallium	4	0	0	106.4	None
Vanadium	4	0	0	97.8	None
Zinc	4	0	0	90.8	None

Table 4-4
Metals Matrix Spike Results

Analyte	# Valid Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
20: 1 SPLP Leachates					
Aluminum	2	0	0	108.2	None
Antimony	2	0	0	112.2	None
Arsenic	2	0	0	93.8	None
Barium	2	0	0	107.9	None
Beryllium	2	0	0	105.7	None
Boron	2	0	0	104.8	None
Cadmium	2	0	0	100.5	None
Calcium	0	NA	NA	NA	*No spikes performed for calcium*
Chromium	2	0	0	105.9	None
Cobalt	2	0	0	104.2	None
Copper	2	0	0	105.5	None
Iron	2	0	0	101.5	None
Lead	2	0	0	100.1	None
Magnesium	0	NA	NA	NA	*No spikes performed for magnesium*
Manganese	0	--	--	--	None
Mercury	2	0	0	101.0	None
Molybdenum	2	0	0	105.3	None
Selenium	2	0	0	91.9	None
Nickel	2	0	0	102.8	None
Thallium	2	0	0	108.7	None
Potassium	0	NA	NA	NA	*No spikes performed for potassium*
Silicon	2	0	1	**130.8**	J MS-H to parent sample only
Silver	2	0	0	103.2	None
Sodium	0	NA	NA	NA	*No spikes performed for sodium*
Vanadium	2	0	0	106.7	None
Zinc	2	0	0	102.0	None
Total Basis Analyses					
Aluminum	0	--	--	--	None
Antimony	2	2	0	**34.4**	**J MS-L for all results**
Arsenic	1	0	0	89.7	None
Barium	2	0	0	87.9	None
Beryllium	2	0	0	99.8	None
Boron	2	0	0	91.9	None
Cadmium	2	0	0	95.1	None
Calcium	0	NA	NA	NA	*No spikes performed for calcium*
Chromium	2	1	0	83.9	J MS-L to parent sample only
Cobalt	2	0	0	93.4	None
Copper	1	1	0	**30.8**	J MS-L to parent sample only
Iron	0	--	--	--	None
Lead	0	--	--	--	None
Magnesium	0	NA	NA	NA	*No spikes performed for magnesium*
Manganese	1	1	0	**58.9**	J MS-L to parent sample only
Mercury	2	0	0	101.9	None

Table 4-4
Metals Matrix Spike Results

Analyte	# Valid Spikes	Recoveries <75%	Recoveries >125%	Average % Recovery	Action
Molybdenum	2	0	0	97.0	None
Selenium	2	1	0	95.4	J MS-L to parent sample only
Nickel	2	0	0	87.9	None
Thallium	2	0	0	107.9	None
Potassium	0	NA	NA	NA	*No spikes performed for potassium*
Silicon	0	--	--	--	None
Silver	2	0	0	97.1	None
Sodium	0	NA	NA	NA	*No spikes performed for sodium*
Vanadium	2	0	0	92.3	None
Zinc	2	1	0	75.6	J MS-L to parent sample only

NQ = No Qualification for a nondetect with a high bias

*With the exception of those samples which reported acceptable matrix spike recoveries.

As indicated in the table, the accuracy of the analyses relative to the site-specific matrix was acceptable, as the average matrix spike recoveries for all metal analytes met the criteria, with the following exceptions: the average matrix spike recoveries for selenium in the FLT leachates, copper in the 2:1 SPLP leachates, silicon in the normal SPLP leachates, and antimony, copper, and manganese in the total basis samples exceeded the recovery criteria. Selenium in the FLT leachates, copper in the 2:1 SPLP leachates, and antimony in the total basis samples were therefore qualified in all associated samples. For the other metals mentioned, the average recovery was either skewed by one excessively high or low recovery or based on only one valid recovery. No global qualifications were added for these metals, since there were insufficient data points to base a determination on. Likewise, no qualifiers were added for metals with no valid spike recoveries due to inappropriate spike concentrations (calcium, aluminum, iron, lead, and silicon in one or more matrices).

In addition, although the average recovery for arsenic in the 18-Hour leachate samples was acceptable, all positive results were qualified due to two of four results above the acceptance range. Conversely, although one of either two or three valid spikes in several other metals were outside the acceptance range, no global qualifications were applied since the average recoveries were acceptable.

Post-Digestion Spikes

Post-digestion spikes were conducted on ICP and ICP/MS analytes to determine whether matrix recoveries outside of the acceptance range were the result of sample matrix, or due to a bias in the analytical system. All post-digestion recoveries for those analytes recovered outside of the acceptance range in the matrix spikes were within the range of 75-125%. Therefore, no qualification of data was assigned for any of the metal analytes on the basis of post-digestion spike recovery, as it was likely that all matrix spike exceedances were due to a matrix effect on digestion rather than a bias in the analytical system.

4.2 LABORATORY DUPLICATE RESULTS (PRECISION EVALUATION)

Laboratory duplicate sample results were evaluated to assess the precision of the laboratory analyses. The evaluation criteria used are summarized in SOP 12.1. Results of laboratory duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, as follows. When both concentration results were sufficiently greater than (>5x) the RL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤30%. If one or both of the concentration results were less than 5x the RL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤2x the RL. For metals, the Contract Laboratory Program (CLP) Contract Required Detection Limit (CRDL) was utilized as the reporting limit (RL) for laboratory duplicate evaluations rather than the instrument detection limits (IDLs) which were used as the quantitative reporting limit.

The RPDs or absolute differences, as appropriate, between the parent and duplicate results for target analytes were within the QAPP acceptance limits for all laboratory duplicate analyses, with the exception of six metals in the total basis samples. Table 4-5 summarizes the exceedances and resultant data qualifiers.

Table 4-5
Summary of Metals Laboratory Duplicate Exceedances

Matrix	Analyte	LD Samples	RPD	|Diff|	Action
Total Basis Samples	Barium	SI50-T01N-MINE-AND	--	8.2 x RL	J FD-I for affected lab duplicate sample only
	Chromium	SI50-T01N-MINE-AND GHGDF1-T02N-DEBRIS	38.2% 42.2%	--	**J LD-I all chromium results**
	Copper	GHGDF1-T02N-DEBRIS	50.8%	--	J FD-I for affected field duplicate samples only
	Lead	SI50-T01N-MINE-AND GHGDF1-T02N-DEBRIS	38.8% 94.5%	--	**J LD-I all lead results**
	Silicon	SI50-T01N-MINE-AND	81.6%	--	J FD-I for affected field duplicate samples only
	Vanadium	SI50-T01N-MINE-AND	--	2.1 x RL	J FD-I for affected field duplicate samples only

No qualifications were applied to samples of any other matrix based on laboratory duplicate results.

4.3 ICP SERIAL DILUTION RESULTS

Serial dilution results are used to evaluate whether or not significant physical or chemical interferences exist that would bias the reported analytical result. This is accomplished by analyzing the sample and a five-fold dilution of the sample. The percent difference (%D) between these two concentrations should be less than 10% for analytes with initial concentrations sufficiently higher (50x) than the IDL (accounting for dilution, if necessary). Serial dilutions were performed on metal samples in every data package. These analyses were run on the same samples as the laboratory duplicate analyses.

Since only two serial dilutions per leachate type were performed, a single exceedance of the 10% criterion was not considered sufficient evidence of a global bias, even though it represents 50% of the serial dilution analyses (and, in some cases, the only valid analysis). In only three cases—silicon in the FLT leachates and potassium and zinc in the total basis samples—did both serial dilutions exceed 10%. Table 4-6 summarizes the serial dilution results by matrix, including the applicable metals (concentration >50x IDL in one or both QC samples), metals with exceedances, numbers of valid results and exceedances, average percent differences, and action taken based on the collective assessment.

Table 4-6
ICP Serial Dilution Overall Assessment

Matrix	Applicable for Serial Dilution Evaluation	Metals with % Difference >10%	# Valid SDs	# %D >10%	Average %D	Action
FLT Leachates	Al, Cd, Ca, Cu, Fe, Mg, Mn, K, Si, Na, Zn	Cadmium	2	1	8.8	J DL-H parent only*
		Iron	1	1	12.6	J DL-L parent only*
		Silicon	2	**2**	**62.0**	**J DL-L all samples**
18-Hour Leachates	Al, Ba, Cd, Ca, Co, CU, Mg, Mn, Mo, Ni, K, Se Si, Ag, Na, Zn	Copper	1	1	17.1	J DL-L parent only*
		Selenium	2	1	12.0	J DL-H parent only*
		Silicon	2	1	12.4	J DL-L parent only*
Shake Flask Leachates	Ba, Ca, Co, Mg, Mn, Mo, Ni, K, Se, Si, Na	Selenium	1	1	10.8	J DL-L parent only*
3:1 SPLP Leachates	Ba, Cd, Ca, Co, Cu, Mg, Mn, Mo, Ni, K, Si, Na, Zn	Cadmium	1	1		J DL-H parent only*
		Nickel	2	1	11.2 9.7	J DL-H parent only*
2:1 SPLP Leachates	Al, Ba, Cd, Ca, Co, Mg, Mn, Mo, Ni, K, Se Si, Na, Zn	Aluminum	1	1	450	J DL-L parent only*
		Selenium	2	1	13.3	J DL-H parent only*
20:1 SPLP Leachates	Al, Ca, Cu, Fe, Mg, Mn, Ni, Si	Aluminum	1	1	44.8	J DL-L parent only*
		Calcium	2	1	7.45	J DL-L parent only*
		Manganese	2	1	8.2	J DL-L parent only*
Total Basis Samples	Al, Ba, Be, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Tl, K, Si, V, Zn	Beryllium	1	1	12.3	J DL-L parent only*
		Cobalt	1	1	13.4	J DL-L parent only*
		Lead	2	1	10.4	J DL-L parent only*
		Nickel	1	1	14.3	J DL-L parent only*
		Potassium	2	**2**	**24.2**	**J DL-L all samples**
		Zinc	2	**2**	**20.9**	**J DL-L all samples**

* Insufficient data points to determine if a global bias exists.

Where exceedances were identified, the diluted result was generally considered more accurate, as the dilution serves to reduce any matrix interference that might be present. Therefore, in determining the bias direction of an assigned qualification, the comparison is made of the initial result to the diluted result. As noted above, factors such as the number of valid measurements relative to the size of the sample set, as well as the average %D and the magnitude of outages were taken into consideration when applying qualification. Of special note is the %D for the single valid aluminum serial dilution in the 2:1 SPLP leachates. The value of 450% was confirmed by recalculating from the raw data, but appears to be an anomaly, since the matrix spike and lab duplicate results for the same sample were within acceptance limits.

Site-specific field duplicate samples were assessed collectively by matrix for the Front Rock Pile Characterization Sampling Event to determine the need for qualification of sample results of similar matrices. Again, for the leachate samples, the samples produced by each leaching method were considered a unique matrix for the collective evaluation. The following section summarizes the results for the field QC samples and any collective qualifications arising from the assessments.

5.1 FIELD DUPLICATE AGREEMENT

The field duplicate agreement assessment evaluated the overall precision of the analyses, both from an analytical and sampling perspective, in addition to how representative these analyses were to the samples. Results of field duplicate sample analyses were evaluated using the concentration-dependent evaluation criteria specified in the QAPP, as follows. When both concentration results were sufficiently greater than (>5x) the RL, accounting for dilution, the RPD was compared to an evaluation criterion of ≤50%. If one or both of the concentration results were less than 5x the RL, again accounting for dilution, the absolute difference between the two sample results was compared to an evaluation criterion of ≤3.5x the RL. The soil evaluation criteria were used for the leachate matrices because the initial sample matrix was soil.

The frequency of field duplicate sample analyses must be at least 5% (one field duplicate for 20 field samples) to comply with the QAPP. Two sample pairs, SSSWOUT-T01N/D-SCAR and SGSDF1-T02N/D-DEBRIS were submitted as field duplicates, for a percentage of 6.7%.

Since only two field duplicates were analyzed for each leachate type, a single exceedance of the QAPP criteria was not considered sufficient evidence of a global bias, even though it represents 50% of the field duplicate analyses. In only three cases—fluoride and aluminum in the Shake Flask leachates and lead in the FLT leachates—did both field duplicate pairs exceed the acceptance criteria, resulting in the global qualification of the associated results. In addition, since fluoride exceeded the acceptance criteria in at least one duplicate pair for four of the five leachate matrices analyzed by SVL, all fluoride results reported by SVL were qualified as estimated with an indeterminate bias (J FD-I). Similarly, since lead exceeded the acceptance criteria in at least one duplicate pair for all five leachate matrices analyzed by SVL and the regular SPLP leachate analyzed by STL, all lead results for leachate samples reported by SVL and STL were qualified as estimated with an indeterminate bias (J FD-I). With the exception of lead in the SPLP leachates, analyses performed by STL did not indicate the need for any qualification beyond the parent samples.

Table 5-1 summarizes the inorganic analyte exceedances and resultant data qualifiers, while Table 5-2 summarizes those for the metals and Table 5-3 summarizes those for the acid-base accounting analyses.

Table 5-1
Summary of Inorganic Field Duplicate Exceedances

Matrix	Analyte	FD Samples	RPD	|Diff|	Action
FLT Leachates	Conductivity	SSSWOUT-T01N/D-SCAR	117%	--	J FD-I for affected field duplicate samples only
	Fluoride	*No exceedance; global qualifier applied due to overall performance*			**J FD-I all fluoride results**
18-Hour Leachates	Fluoride	SSSWOUT-T01N/D-SCAR	93.6%	--	**J FD-I all fluoride results**
Shake Flask Leachates	Fluoride	SSSWOUT-T01N/D-SCAR SGSDF1-T02N/D-DEBRIS	152% 148%	-- --	**J FD-I all fluoride results**
3:1 SPLP Leachates	Chloride	SGSDF1-T02N/D-DEBRIS	--	8.0 x RL	J FD-I for affected field duplicate samples only
	Fluoride	SSSWOUT-T01N/D-SCAR	111%	--	**J FD-I all fluoride results**
2:1 SPLP Leachates	Fluoride	SSSWOUT-T01N/D-SCAR	92%	--	**J FD-I all fluoride results**
Total Basis Samples	Sulfate	SSSWOUT-T01N/D-SCAR	59.5	--	J FD-I for affected field duplicate samples only

Table 5-2
Summary of Metals Field Duplicate Exceedances

Matrix	Analyte	FD Samples	RPD	|Diff|	Action
FLT Leachates	Copper	SGSDF1-T02N/D-DEBRIS	52%	--	J FD-I for affected field duplicate samples only
	Lead	SSSWOUT-T01N/D-SCAR SGSDF1-T02N/D-DEBRIS	**99%** --	-- **13.6 x RL**	**J FD-I all lead results**
18-Hour Leachates	Lead	SSSWOUT-T01N/D-SCAR SGSDF1-T02N/D-DEBRIS	**80%** **114%**	-- --	**J FD-I all lead results**
	Iron	SGSDF1-T02N/D-DEBRIS	71%	--	J FD-I for affected field duplicate samples only
Shake Flask Leachates	Aluminum	SSSWOUT-T01N/D-SCAR SGSDF1-T02N/D-DEBRIS	**54%** --	-- **180 x RL**	**J FD-I all aluminum results**
	Lead	SSSWOUT-T01N/D-SCAR	--	7.3 x RL	J FD-I for affected field duplicate samples only; **J FD – I for all lead results.**
	Beryllium	SGSDF1-T02N/D-DEBRIS	--	11 x RL	
	Cadmium		72%	--	
	Cobalt		106%	--	
	Copper		--	28.3 x RL	
	Iron		86%	--	
	Molybdenum		--	13.2 x RL	
	Selenium		86%	--	
	Silicon		51%	--	
	Zinc		--	3.8 x RL	
3:1 SPLP Leachates	Beryllium	SGSDF1-T02N/D-DEBRIS	63%	--	J FD-I for affected field duplicate samples only. **J FD – I for all lead results.**
	Boron	SGSDF1-T02N/D-DEBRIS	--	6.4 x RL	
	Copper	SGSDF1-T02N/D-DEBRIS	60%	--	
	Lead	SSSWOUT-T01N/D-SCAR	90%	--	
	Sodium	SGSDF1-T02N/D-DEBRIS	50%	--	
2:1 SPLP Leachates	Aluminum	SGSDF1-T02N/D-DEBRIS	62%	--	J FD-I for affected field duplicate samples only
	Arsenic	SSSWOUT-T01N/D-SCAR	101%	--	
	Barium	SSSWOUT-T01N/D-SCAR	138%	--	
	Beryllium	SGSDF1-T02N/D-DEBRIS	87%	--	
	Copper	SGSDF1-T02N/D-DEBRIS	94%	--	

Table 5-2
Summary of Metals Field Duplicate Exceedances

Matrix	Analyte	FD Samples	RPD	|Diff|	Action
	Iron	SGSDF1-T02N/D-DEBRIS	61%	--	
	Lead	SSSWOUT-T01N/D-SCAR SGSDF1-T02N/D-DEBRIS	**108%** **--**	**--** **21 x RL**	**J FD-I all lead results**
	Silver	SSSWOUT-T01N/D-SCAR	--	29 x RL	J FD-I for affected field duplicate samples only
	Vanadium	SSSWOUT-T01N/D-SCAR	--	4 x RL	
Total Basis Samples	Copper	SSSWOUT-T01N/D-SCAR	78.3%	--	J FD-I for affected field duplicate samples only
	Zinc	SSSWOUT-T01N/D-SCAR	144%	--	
	Lead	SGSDF1-T02N/D-DEBRIS	53%	--	
20:1 SPLP Leachates	Lead	SSSWOUT-T01N/D-SCAR	132%	--	**J FD-I all lead results**

Table 5-3
Summary of ABA Field Duplicate Exceedances

Matrix	Analyte	FD Samples	RPD	|Diff|	Action
Solid	Sulfur HCL Extractable (sulfate)	SSSWOUT-T01N/D-SCAR	53%	--	J FD-I for affected field duplicate samples only
	Acid Neutralization Potential (ANP)	SGSDF1-T02N/D-DEBRIS	96%	--	
	Net Acid Neutralization Potential (NANP)	SGSDF1-T02N/D-DEBRIS	126%	--	

All data were considered acceptable for use in meeting project objectives as qualified. Multiple sample results were qualified as nondetect on the basis of contamination identified in the laboratory blanks. Others were qualified as estimated on the basis of matrix spike results. Lastly, a number of data results were qualified as estimated on the basis of holding time exceedances, serial dilution results, or laboratory/field duplicate disagreements. These findings are discussed in greater detail in the individual data review summaries (Attachment 1). The data quality assurance objectives, as found in Section D of the QAPP, were reviewed to verify that final data met data quality objectives.

6.1 PRECISION

Precision measures the repeatability of data by examining the spread of individual values from the average reported values, and therefore describes the magnitude of errors. The closer the numerical values of the measurements are to one another, the more confidence there is in the precision of the analysis. Precision for a single analyte was expressed as a Relative Percent Difference (RPD) or as an absolute difference between field duplicate or laboratory duplicate results. Table 6-1 summarizes the percentage of valid precision measurements across all matrices that satisfied the applicable evaluation criteria for each analysis type.

Table 6-1
Summary of Precision Assessment

Analysis Type	QC Measure	# of Analytes Measured	# Within Criteria	% Results within Criteria
Inorganics	LD	57	56	98.2%
	FD	66	58	87.9%
Metals	LD	354	346	97.7%
	FD	354	317	89.5%
ABA	LD	14	14	100%
	FD	14	11	78.5%

The percentage of acceptable precision measurements for individual parameters ranged from 58.3% (fluoride field duplicate) to 100% (a number of parameters). The overall level of precision demonstrated for all analyses collectively was considered to be acceptable.

6.2 ACCURACY

Accuracy describes how close a result is to a specific target. It is a measure of the bias in a measurement system. The closer the value of the measurement agrees with the true value, the more accurate the measurement. Accuracy for a single analyte was expressed as a percent recovery in a laboratory control sample (LCS) or matrix spike (MS). Results for metals laboratory control samples (LCSs) were not reviewed at the level of sample specific review, since no exceedances were noted during the laboratory specific reviews and the laboratory case narratives did not note any LCS recoveries outside the acceptance range of 75-125%. As noted in section 3.2.2 above, the general chemistry LCS results were reviewed for each data package. The results of these reviews are provided in the individual data review summaries (see Attachment 1). The numbers and percentages of valid MS recoveries across all matrices that met the acceptance criteria are summarized in Table 6-2.

Table 6-2
Summary of Accuracy Assessment

Analysis Type	QC Measure	# of Valid Spikes	# Within Criteria	% Results within Criteria
Inorganics	MS	66	62	93.9%
Metals	MS	530	509	96.0%

The percentage of acceptable accuracy measurements for individual parameters ranged from 78.9% (copper) to 100% (a number of parameters). Results associated with low or high matrix spike recoveries were qualified accordingly. The overall level of accuracy with respect to the site matrices demonstrated for all analyses collectively was considered to be acceptable.

6.3 COMPLETENESS

Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements to measurements requested.

All of the results were considered usable as qualified for meeting project objectives. As such, a percentage of 100% was calculated to represent the completeness of the Rock Pile leachate samples, which satisfied the QAPP completeness goal of 80%.

6.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is achieved in part through using standard sampling and analytical procedures described in this QAPP and supporting FSP and SOPs (URS, 2002). Representativeness is also influenced by appropriate program design and such elements as proper well locations and sampling locations.

The agreement between the field duplicate results was used to assess representativeness for the Rock Pile samples. As relatively few data results were qualified on the basis of field duplicate disagreement (as discussed in Section 5.1), the samples collected were adequately representative of the medium sampled.

Laboratory or method duplicates were used to evaluate how representative an aliquot taken from a sample was of a given sample. Again, the close agreement between the laboratory duplicates, noted in Sections 4.2 and 6.1, indicated that sample processing and subsampling procedures were acceptable.

6.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data sets are considered comparable only when precision and accuracy are considered acceptable during data validation. This goal was achieved through following standard operating procedures (SOPs) to collect and then analyze representative samples and through reporting analytical results in appropriate and consistent units. In essence, comparability was maintained by consistency in sampling conditions, selection of sampling procedures, sample preservation methods, analytical methods, data reporting units, and acceptable overall accuracy and precision.

6.6 SENSITIVITY

Selected analyses were performed at dilutions to eliminate/minimize matrix interferences or to quantify over-range target analytes. The laboratory reported the metals results relative to the IDL rather than the routine RL to meet the QAPP Maximum Reporting Limit requirements for

all metals. While it is anticipated that all non-rejected data will be usable in the risk assessment, the data users will need to assess the affect of any nondetect results with elevated reporting limits on meeting project objectives.